THE INDEPENDENT GUIDE TO PERSONAL COMPUTING JANUARY 10, 1995 VOL. 14 NO. 1 U.S. $3.95 / CAN. $4.95 / U.K. £2.95

PC MAGAZINE

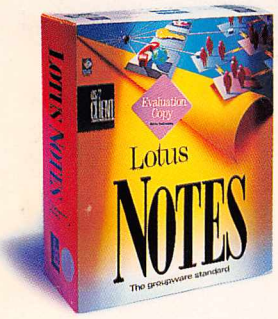
Service & Reliability:
A Report Card from Our Readers

READERS' REPORT CARD: DESKTOP SYSTEMS

Grade	Vendor	From 1994
A	Compaq	—
	Dell	—
	Digital	—
	Gateway	—
	HP	—
	IBM	—
	Micron	—
	Northgate	—
	ZEOS	—

Getting a Grip on Your Money: Personal Finance And Investing

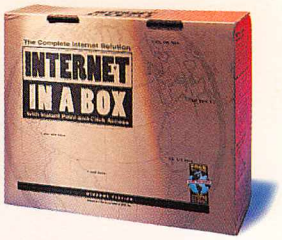
Unplugged! PC Labs Tests 4 Solutions for Wireless Networks





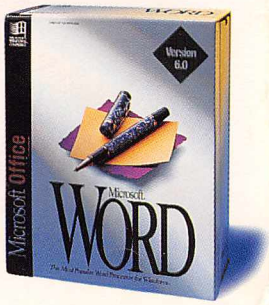
BEST PRODUCTS of 1994





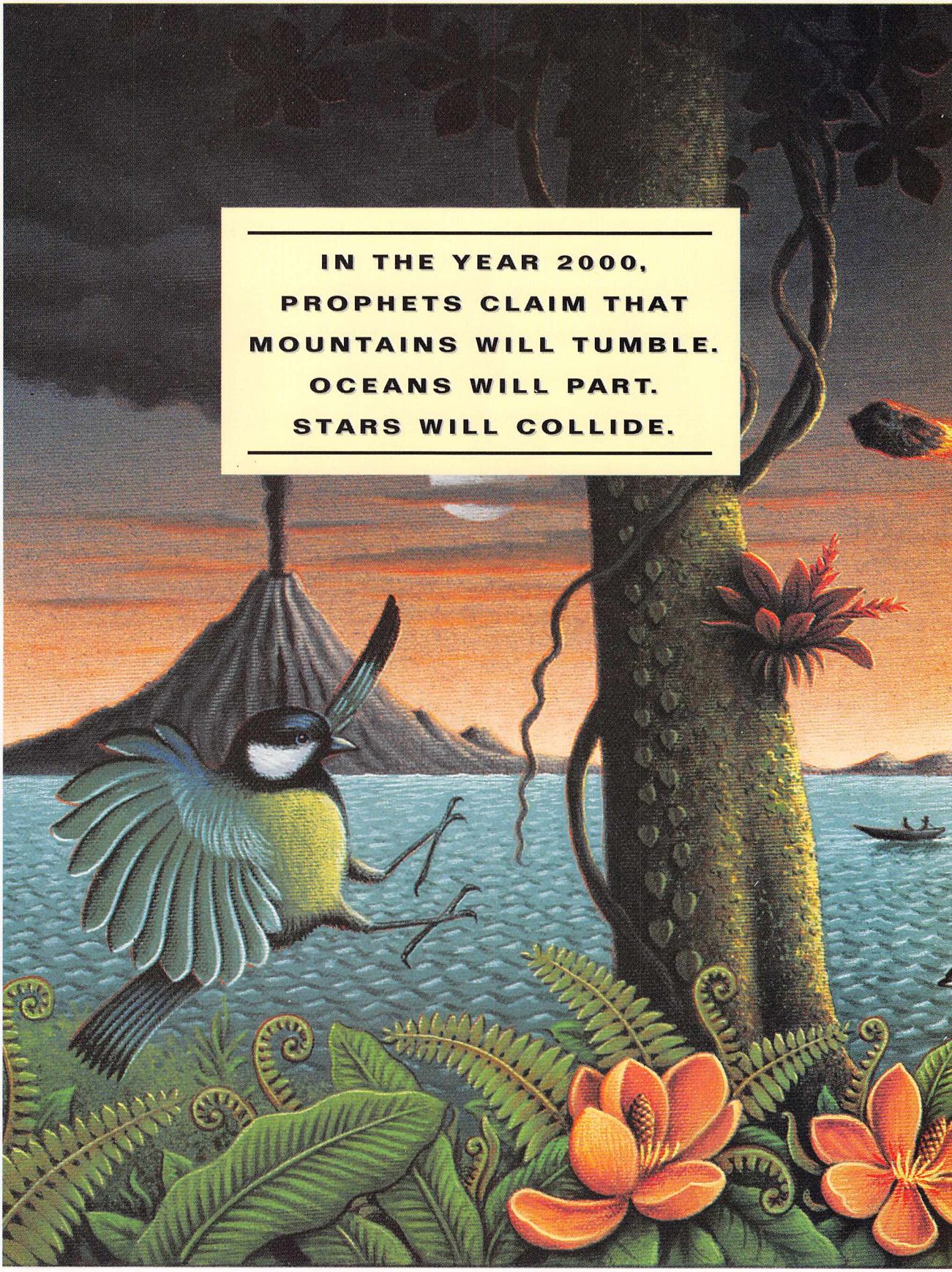






Our Editors Pick Their 50 Favorites

02391


IN THE YEAR 2000,
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MOUNTAINS WILL TUMBLE.
OCEANS WILL PART.
STARS WILL COLLIDE.

Chances are, you're neither a prophet, oracle, nor soothsayer. So you may have a difficult time predicting the future. Hence, you tend to be skeptical when a computer manufacturer professes to offer technology to meet your corporate needs *ad infinitum*.

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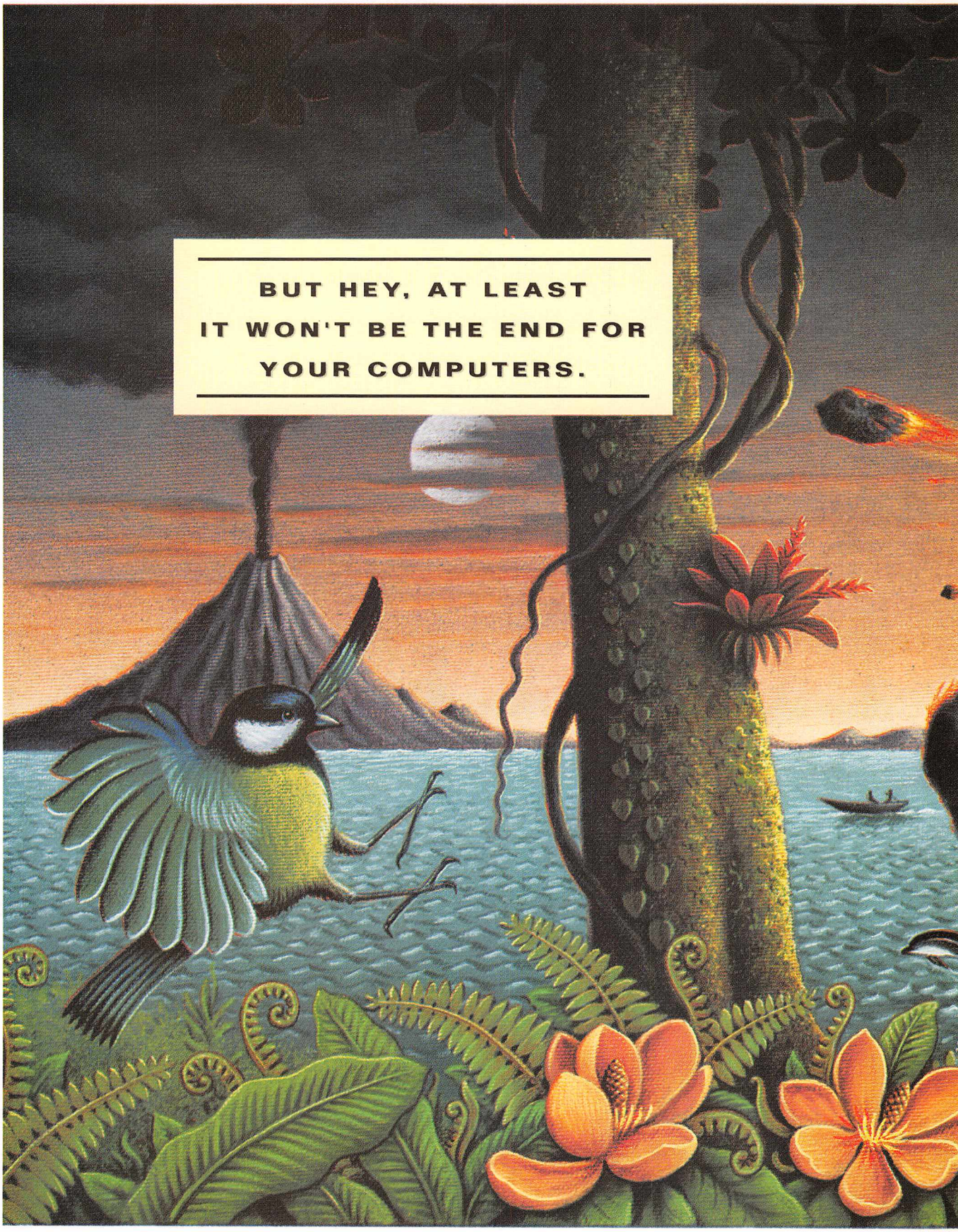
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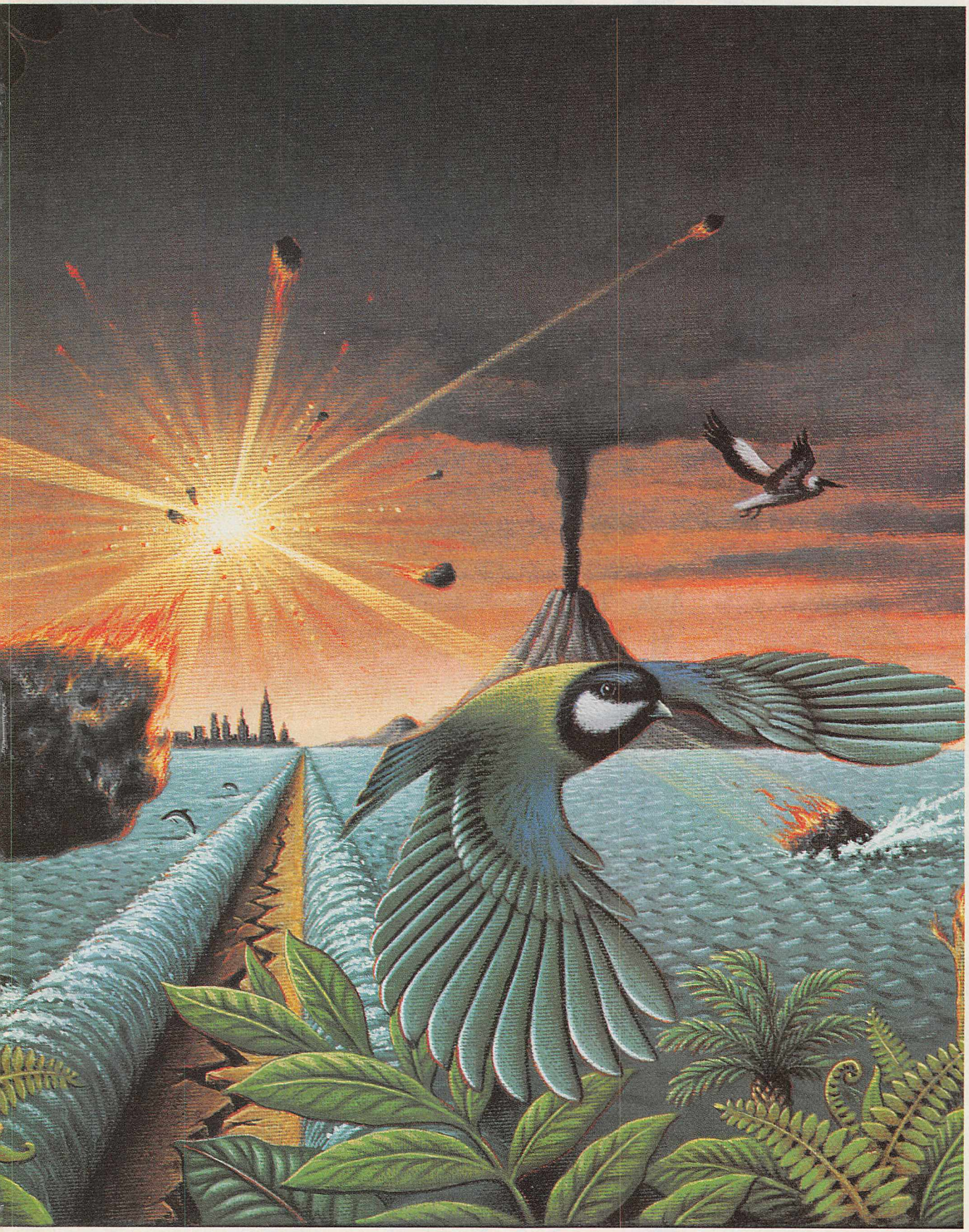
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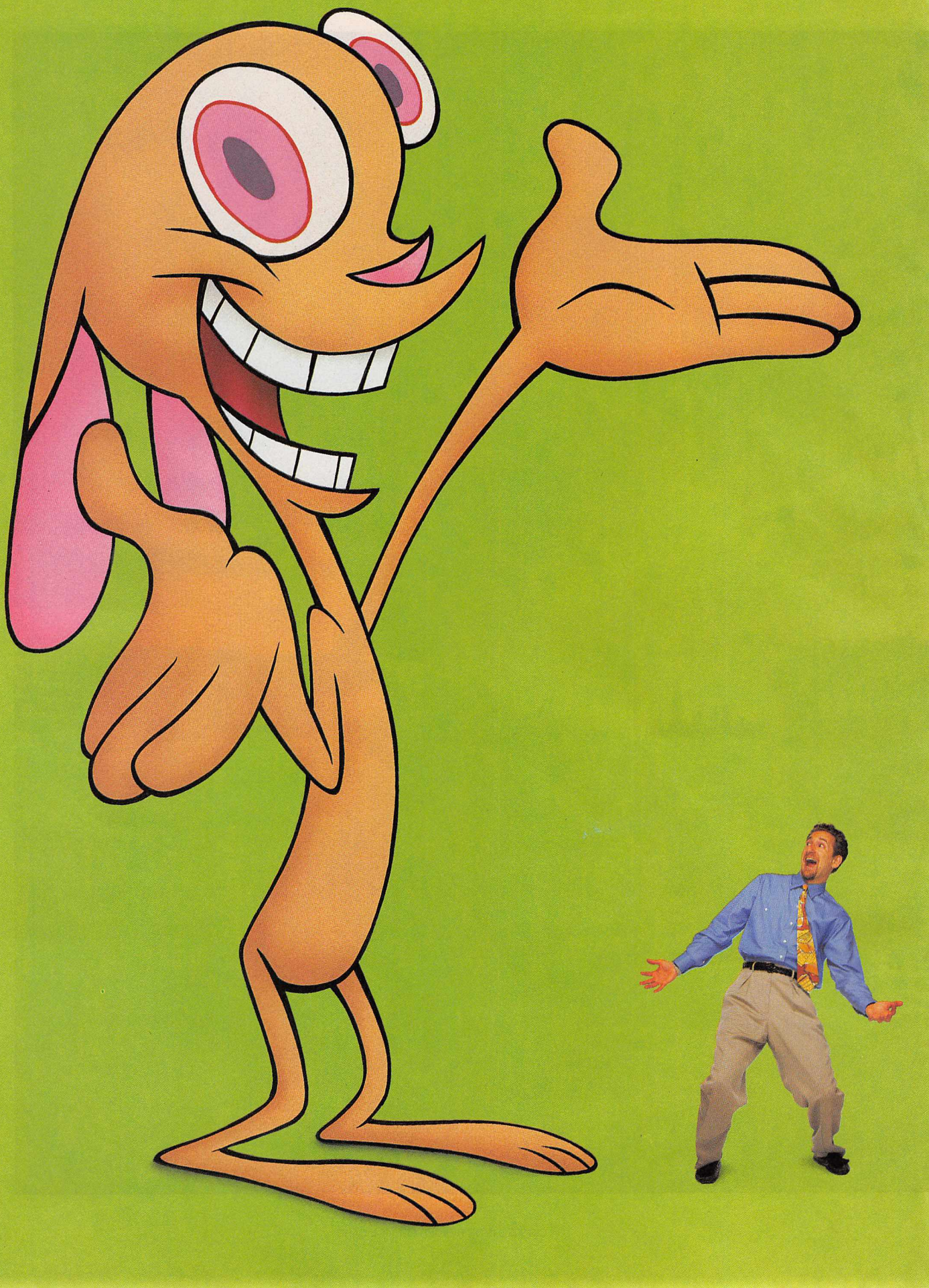
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BUT HEY, AT LEAST
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YOUR COMPUTERS.



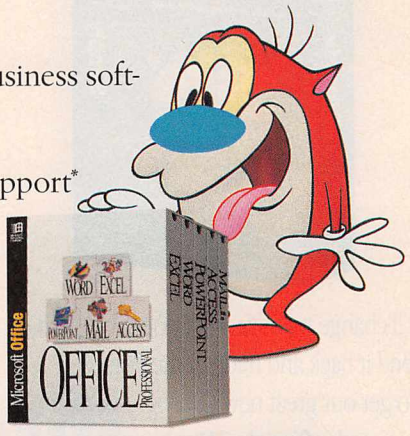
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Matthew Goldstein (the one wearing pants) is a big kid at heart. His mission is to spread the hip, irreverent, "for kids only" Nickelodeon® brand into every new market he can find. That means a lot of meetings. A lot of presentations. Naturally he relies on Microsoft® Office to help him put it all together. "Everything is all linked. It's all one. And it just makes life so easy," says Matthew. "It makes an unbelievable difference." We call this phenomenon OfficeLinks. And it means that sharing text, data and graphics is, well, child's play. It's just one reason Microsoft Office is the leading family of business software. And to make sure it stays so popular, we offer the only unlimited support* with no service charge for a product of this kind. So call (800) 240-4782, Dept. 4GG, for our free Office Information Kit.** Then see how Microsoft Office could help your business enjoy a growth spurt of its own.

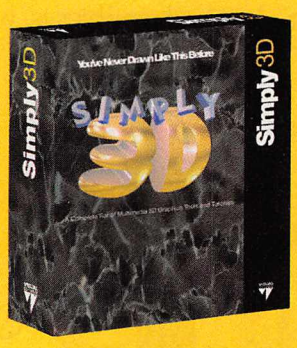
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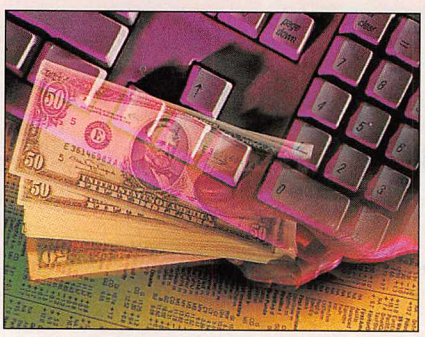
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Inside

A new year—time for our annual roundup of personal finance software. It should have been business as usual, but midway through our testing process, the world of personal finance turned topsy-turvy. Microsoft is proposing to buy Intuit for $1.5 billion. The impetus was simple: For years, Scott Cook of Intuit has valiantly been trying to shake the banking community out of its reverie, alerting it to the potential of home banking. What Intuit couldn't do, Microsoft possibly could. But at what price? Intuit made its reputation by promoting a "customer comes first" mentality. Can Microsoft maintain Intuit's loyal following?



And how does Novell fare? Microsoft practically dumped Money, its homegrown personal finance package, in Novell's lap, but will it boost Novell's sluggish consumer line? Then there's Managing Your Money, from MECA Software. MECA is owned by H&R Block, so it's surprising there hasn't been more synergy between the two. Computer Associates, still trying to gain a foothold in this market with its Simply Money product, has begun a branding strategy of its own, distributing the product through various "designer labels." The personal finance products are interesting; the market implications make "Seize Control of Your $$$" a riveting read.

The new year has certain unwavering traditions for us here at *PC Magazine* as well. Our Best of the Year story has always served as an important marker for where we've been and where we're going. This year's picks are a good read, and whether you're interested in a PIM or a sound board, you'll find what we consider the best products on these pages.

Finally, the new year welcomes back an old friend. Ray Duncan, one of our first contributing editors and one of the most lucid and technically astute writers in this industry, is back after a well-deserved rest period. His Power Programming columns will once again grace these pages. Read "Electronic Publishing with Windows Help" to find out what Ray's been thinking about while he's been gone.

Another year—our fourteenth year of publishing. Another Issue 1. Another chance to commit ourselves to providing you with the best coverage in this industry.

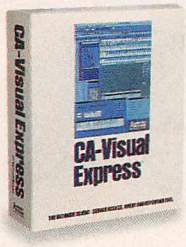
Happy New Year!

—Robin Raskin

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Photo by Douglas Levere

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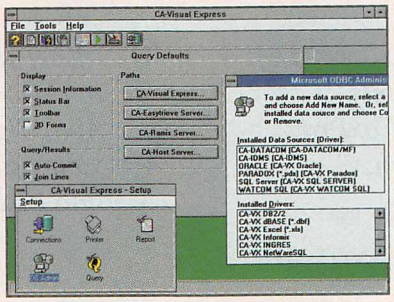
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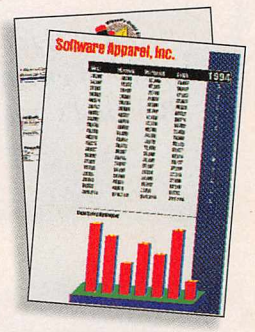
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—*Los Angeles Times*, September 21, 1994

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—*Windows Sources*, September 1994

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—*PC/Computing*, July 1994

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—*PC Week*, May 2, 1994

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THE BEST OF 1994





BY ROBIN RASKIN

In 1994, thousands of new products went through PC Magazine Labs for review. Here's a look at the top 50—the ones that really bowled us over. Many are Editors' Choice winners; some are perennial favorites or personal picks. To round off our wrap-up, Jim Seymour delivers his sardonic "Thumbs Up, Thumbs Down" salute, and Don Willmott offers a special edition of Abort, Retry, Fail? **111**



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Cover photography by Michel DelSol

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Making the Grade

BY BILL HOWARD

Which vendors offer their customers the very best in service and technical support? Through our semiannual survey of Service and Reliability, *PC Magazine* subscribers tell us which companies they think are best at providing support services in four hardware areas: desktop and notebook PCs, monitors, and printers **157**

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Wireless LANs: No Strings Attached

BY PADRAIC BOYLE

With a wireless LAN adapter and access point, you can be at the office and on the network but not tied to your desk. Here are five wireless LAN solutions that are based on radio-frequency technology and offer acceptable performance for some typical applications. These products have come a long way over the past year: Overall, they are faster, offer better value, and have a greater range than ever before. Although they are still much slower than wired solutions, these products have emerged as a option that network managers can offer to today's mobile work force.....**215**

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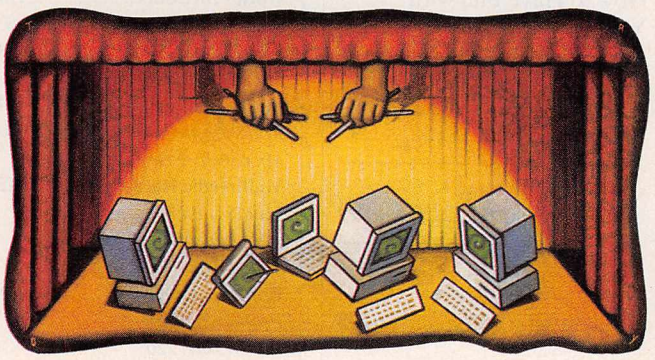
Software

Personal Finance: Seize Control of Your $$$

BY HOLLY McL. KETRON, GREGG KEIZER, KATHY YAKAL, AND THERESA W. CAREY

Today, an ever-widening universe of software and services is letting tens of millions of PC users take control of their finances on a level previously reserved for the sophisticated few. Financial institutions and international money wizards have been zooming wealth around electronically for years, and now you can enter the same world with simple clicks and keystrokes. *PC Magazine* looks at five personal finance managers and, for the first time ever, seven investment packages.....**185**

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—Available on PC MagNet.

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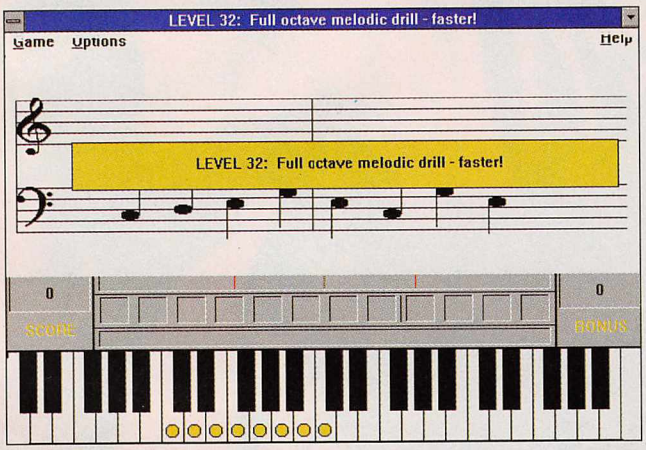
BY DON WILLMOTT. 372



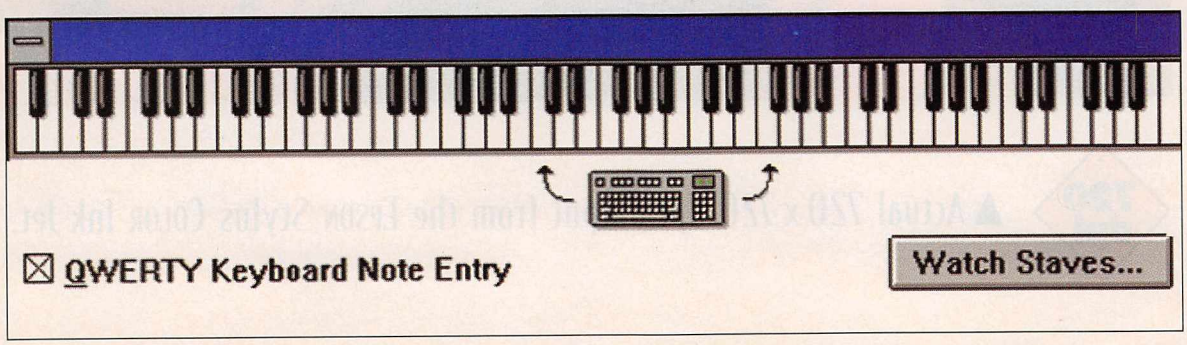
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Making music on your PC has never been easier (page 363).



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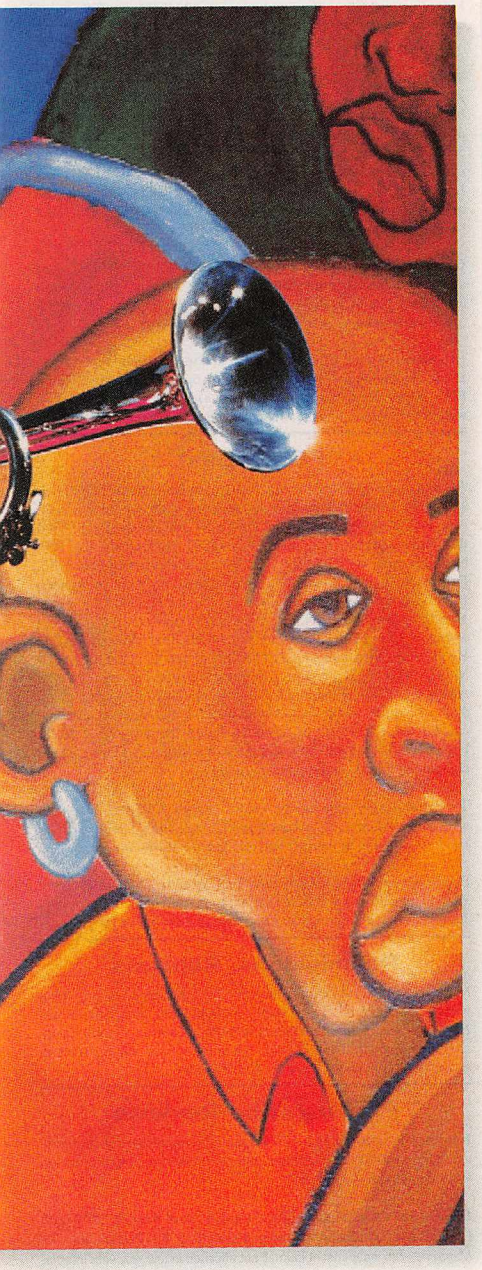


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Invasion of the 64-bit Graphics

The squadron of 64-bit graphics accelerators from ATI – the GRAPHICS PRO TURBO, WINTURBO and GRAPHICS XPRESSION – has landed. Affordably priced from only $179, they're attacking computers with rocket-like performance, laser sharp graphics and galactic true colors.

- Fast 64-bit Acceleration
- Affordably Priced from $179**
- Instant Windows Mode Switching

Hi-res, True Color Galaxies

Resistance is futile. High resolutions of up to 1280x1024 and 16.7 million true colors will overwhelm you. These advanced accelerators propel applications faster in true color than other cards using just 256 colors. And the superior performance, up to 42 million Winmarks*, will conquer even the most complex applications. Plus, the flicker-free display – at up to 100Hz – reduces eye-strain over prolonged periods of attack.



FlexDesk+
For enhanced operation and complete control of Windows options

Propelling Windows

Armed with an arsenal of utilities to enhance Windows, the *mach64* graphics accelerators breeze through Windows applications quickly and effortlessly. The unique WinSwitch feature allows color and resolution to be changed - *without restarting Windows.* A stellar range of software drivers enable popular operating systems to be explored – OS/2, UNIX, Windows NT, CAD, DOS and others.



WinSwitch
Change resolution and color without exiting Windows

Beam up an ATI 64-bit graphics accelerator today. There's one to meet every application, budget and bus type. They're light years ahead of other accelerators.

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* WinBench 4.0 and PC Bench 8.0 performance tests done on a Pentium 90MHz, 16MB RAM, 256K cache, 420 MB HD, using 2MB and 4MB PCI graphics cards. WinBench 4.0 at 1024x768/256 colors (large fonts) and 800x600 in 16.7M colors (small fonts) at 70Hz refresh rate.
**Suggested US retail price, dealers may sell for less.

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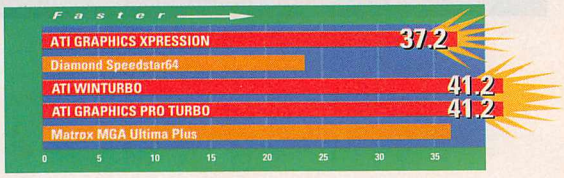
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Outperforms other accelerators in Windows.

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WINTURBO

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- 2MB VRAM memory
- VRAM offers better performance at higher refresh and color depths

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GRAPHICS XPRESSION

- Performance equal to VRAM accelerators at 256 colors
- 1MB (upgradeable) to 2MB DRAM memory
- Up to 75Hz flicker-free display

$179-1MB $249-2MB**

July 25th 1994



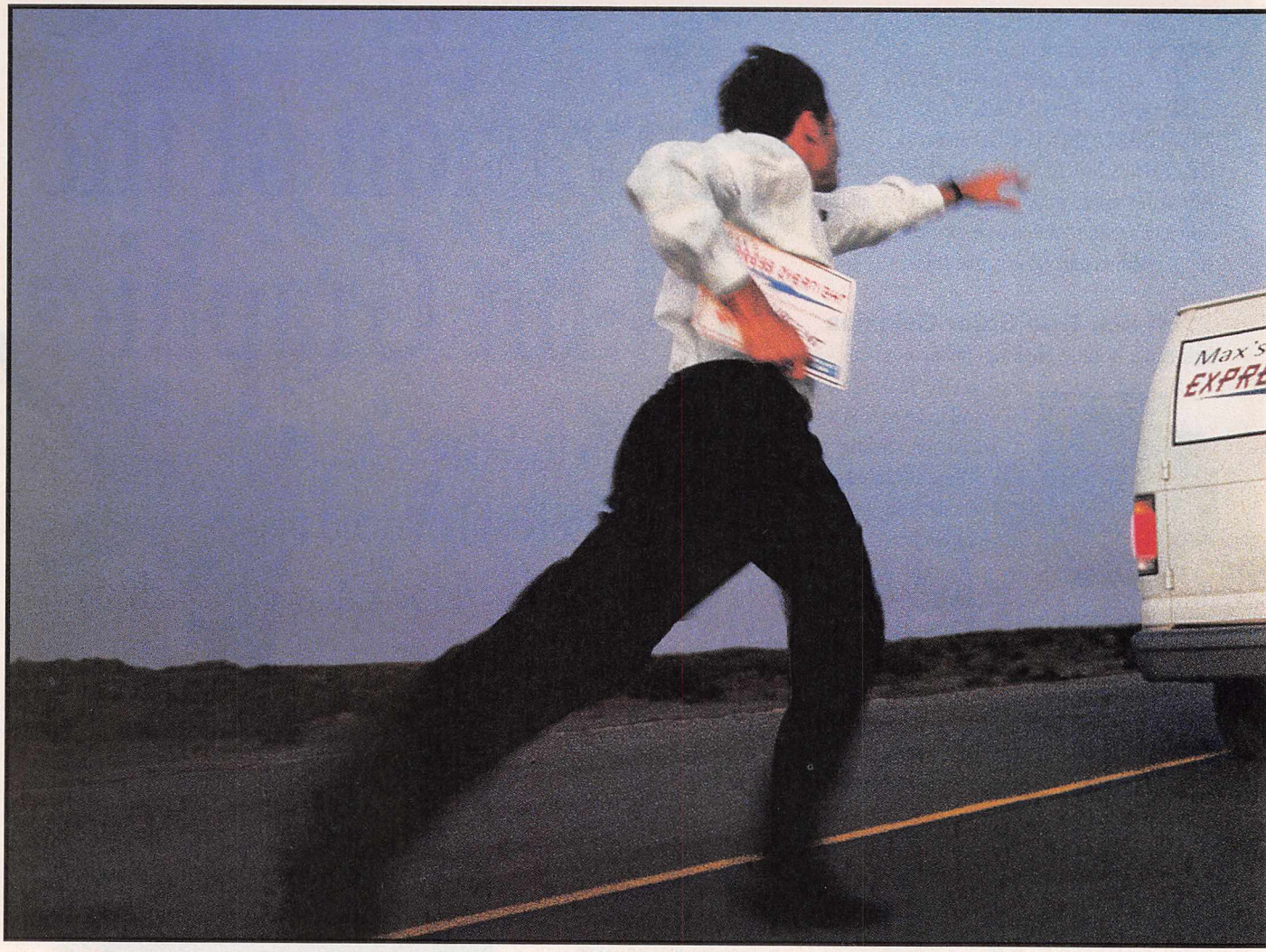
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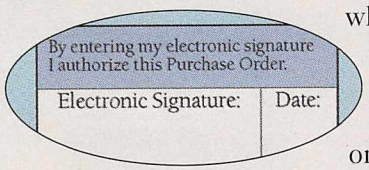
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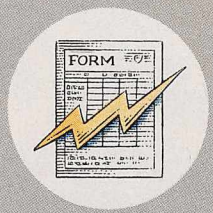
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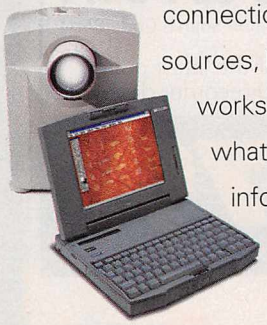
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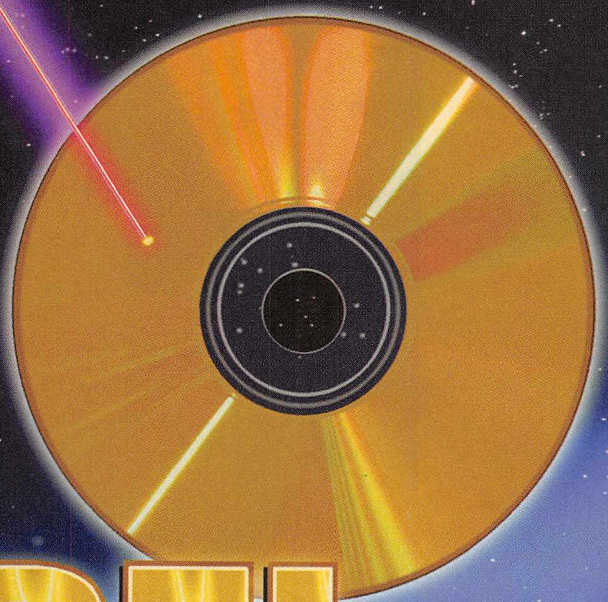
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Letters

INTERNET E-MAIL: FREE OR FEE?

Bill Howard's column on e-mail struck a chord ("Free E-Mail Can Be Costly," September 13, 1994). Everyday people, like myself, are continually redefining the computer's place in society, taking the PC from the hands of computer gurus and remaking it in their own image. We need to communicate with one another, and e-mail is an efficient and thrifty way to do so at light speed. Though I agree with Howard that a filtering system may be needed, if using e-mail "gratuitously" ever earns me a rebuke, I'll wear my scarlet "E" with pride.

Carl Knaak
via PC MagNet

E-mail and the Internet are basically services, and I concur with Howard's point. Telephones, conventional mail, cellular phones, pagers, and fax machines are all forms of communication that require payment. As a means of communication, e-mail should be placed in the same category, and therefore a service charge should be expected, especially with so many users and abusers of e-mail and Internet services. Keep in mind that every time the price is raised for a stamp, people complain. Yet they don't stop sending letters, because communication is important.

Imelda P. Cachin
via the Internet

There are benefits in charging for the privilege of using internal e-mail. After all, the mail database is taking up storage space on company file servers; why not make users pay rent for those messages they're needlessly stockpiling?

Anthony F. Navarro
via PC MagNet

The Internet and e-mail in general are currently among the few aspects of society where one's intelligence and communicative skills rise above one's social standing and wealth. My words are as valuable and accessible as those of others.

Christopher Learned
via the Internet


Bill Howard

Free E-Mail Can Be Costly

Electronic mail is like red wine: It's beneficial in moderation but ruinous in excess. And to speak frankly, we've become a nation of e-mail users badly in need of a 12-step get-well program. The problem: too many messages, not enough information.

If using e-mail "gratuitously" earns me a rebuke, I'll wear my scarlet "E" with pride.

What's really happening with e-mail is simply that people are responding to something they like, as children do with newly discovered toys. People like e-mail—it's cheap, easy, quick, and fun—so they use it. There will always be something to keep people who are lazy, unfocused, and undisciplined from doing their jobs; don't lay all the blame on e-mail.

Richard A. Smith
via the Internet

In any form, mail is mail; even trivial mail exists for a reason. The U.S. Postal Service doesn't require a particular level of intellectual content, hence the volumes of junk mail received every day.

Frank DiMauro
via the Internet

Howard's diatribe on the abuse of e-mail is shortsighted micromanagement at its finest. While most users of the Internet are initially overwhelmed by the vastness and immediacy of e-mail and Usenet newsgroups, intelligent users quickly acclimate to its productive qualities. And an occasional stress-breaking foray into rec.pets.cats is no different than a trip to the coffee machine, a walk outside for a smoke break, or a run to the watercooler.

Stephen W. Dennison
via the Internet

The FYI and CYA variety of memos have been around ever since copiers made them cheap and word processors made them expedient. This is a problem for management to handle, not the internal mail system's postmaster or the Internet police. And fewer trees die to send e-mail.

William E. Garber
via the Internet

If Howard wanted to focus on hypnotic, productivity-sucking elements of the Internet, he shouldn't have put his emphasis on e-mail exclusively. I've spent hours browsing around Usenet, and Gopher can kill even more time. Also, if he wants all Internet users to be charged for e-mail, he's going to get an earful from the educational and scientific institutions for which the Internet was originally constructed.

R. Jason Weiss
via the Internet

PENTIUM'S POWERFUL PUNCH

Your roundup "90-MHz Pentium PCs: Pentium Powerhouses" (September 27, 1994) was quite informative and helpful. But you omitted discussion of one important factor in expandability. Most of the machines come with a standard 16MB of RAM. All can be expanded further, but the memory configuration of some machines requires that the original memory modules be discarded before more memory can be added. Other machines allow for the simple addition of more memory, hence a significant savings to the consumer when expanding from 16MB to 32MB.

Ivan K. Rothman
Merrick, New York

Although some of the reviewed PCs came from companies that are well known, many others were made by companies that few readers know anything about. Inquiring minds want to know about these mystery companies. The quality of a machine is more than the



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LETTERS

sum total of its assembled parts; it also depends on the history and track record of the manufacturer.

Steve Weiner
via the Internet

Regarding your review of 90-MHz Pentium PCs, it seems that IDE is significantly faster then SCSI, but the story might change with the use of a fully preemptive, multitasking environment such as IBM OS/2, Microsoft Windows NT, or Microsoft Windows 95. Next time around, consider an evaluation of SCSI and IDE boards on the different operating systems available.

Alain J. Duclos
via the Internet

A PLAGUED FUTURE?

My hearty commendations for finally revealing the gory details of Microsoft's plan for the future of computing. One cannot read "Which Win32 Is for You?" (September 27, 1994) without alarm and dismay. This amazing article reveals the true nature of the structural flaws in Microsoft's system. If the computer community meekly submits to Microsoft's grand 32-bit strategy, it is doomed to yet another decade of dysfunctional system software, the technological equivalent of the equipment that caused the nuclear meltdown at Chernobyl.

William B. Fankboner
La Quinta, California

MODEM MYSTERIES UNVEILED

You are to be congratulated for Jeff Prosise's Tutor column "Your Modem's Language: The AT Command Set" (September 27, 1994). This is the first time I've found the AT language presented in a totally comprehensive and understandable manner. I look forward to more of these articles.

Lovitt Henderson
via PC MagNet

Thanks for Prosise's informative and easy-to-understand article on modem commands. It removed a lot of the mystery surrounding how modems work.

Mick Luce
via PC MagNet

BATTING-RANGE TARGET

In your latest roundup of file servers ("File Servers: Data on Demand," October 11, 1994), everyone seems to be lining up to take potshots at IBM's Micro Channel architecture (MCA), and yet the system with it was one of the top performers and had the lowest CPU utilization of the servers tested. Also, MCA does quite well in burst-mode throughput, which is often more important than continuous throughput. While all of this may become moot if PCI does become the standard for servers, it's a little early to proclaim the death of MCA.

Macrae Morse
via PC MagNet

A PLUG-AND-PRAY WORLD

After reading John C. Dvorak's column "Plug and Pray" (October 11, 1994), I realized that no matter how much the PC universe wants compatibility of some sort, plug-and-play will never really happen. On the other hand, it's an idea that's worked with hardly a glitch for the Macintosh. My first frustrating foray into the world of PCs—during which I couldn't install my PCMCIA modem's software because the sole PCMCIA slot was required by the floppy disk drive—hammered home that the Mac may be a lot of things, but at least it works.

Richard M. Chernoff
Fair Lawn, New Jersey

BEYOND THE CD-ROM FIASCO

John C. Dvorak's column "The Impending CD-ROM Fiasco" (September 27, 1994) was highly enjoyable. Dvorak identified an important factor in the continuation of CD-ROM technology.

Bill Royer
via PC MagNet

In today's market, it is a simple fact that if a product doesn't keep up with current hardware and software, it cannot possibly hope to survive. Dvorak did an excellent job supporting that argument with respect to CD-ROM drives.

Nathan A. Behary
Forest Park, Illinois

POLITICAL SCIENCE, PC STYLE

Michael J. Miller's column "The Politics of PC Science" (September 27, 1994) asks the wrong questions. Some of the issues raised with protecting intellectual property rights are legitimate, but on other matters—such as those of economic policy—the only question that ought to be asked is should the government meddle in the computer industry. And the only answer is for the relationship between Washington and the computer industry to remain strictly laissez-faire.

Raymond Hewitt
Montville, New Jersey

DRIFTING FARTHER APART

The real technology rift, beyond what Bill Machrone discusses in his column "The Technology Rift" (September 27, 1994), is the total lack of computer literacy for those who live and are educated in our deprived communities and ghettos. They aren't turning their backs on technology; they just don't even know it exists.

Michael D. Brooks
via the Internet

CORRECTIONS AND AMPLIFICATIONS

The First Looks review of the Canon BJC-4000 ("Five Ink Jet Printers That Let You Colorize Your Work," October 25, 1994) erroneously stated that the printer's text resolution is 360 dpi; it's actually 720 by 360 dpi.

The correct toll-free phone number for CyberMedia's First Aid for Windows users 1.2 (First Looks, "Keep Windows Healthy with These Six Problem Solvers," November 8, 1994) is 800-529-2373.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments and suggestions. Please send correspondence to Letters, *PC Magazine,* One Park Ave., New York, NY 10016-5802. You can send electronic mail via the Internet to 157.9301@mcimail.com, or you can upload it to PC MagNet (see page 12 for access information). You can also send e-mail to individual editors. Type GO PCMSTAFF on ZiffNet for a list of addresses. All letters become the property of *PC Magazine* and are subject to editing.

Cool Computer Upgrades.

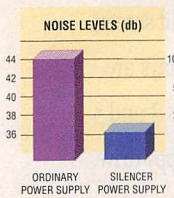
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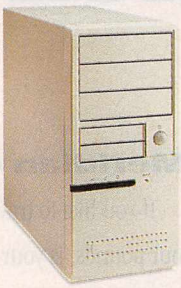
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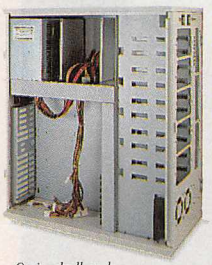


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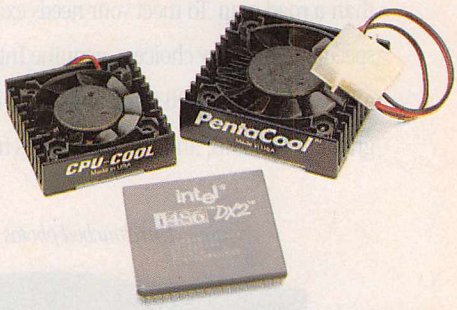
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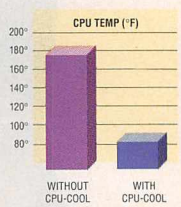
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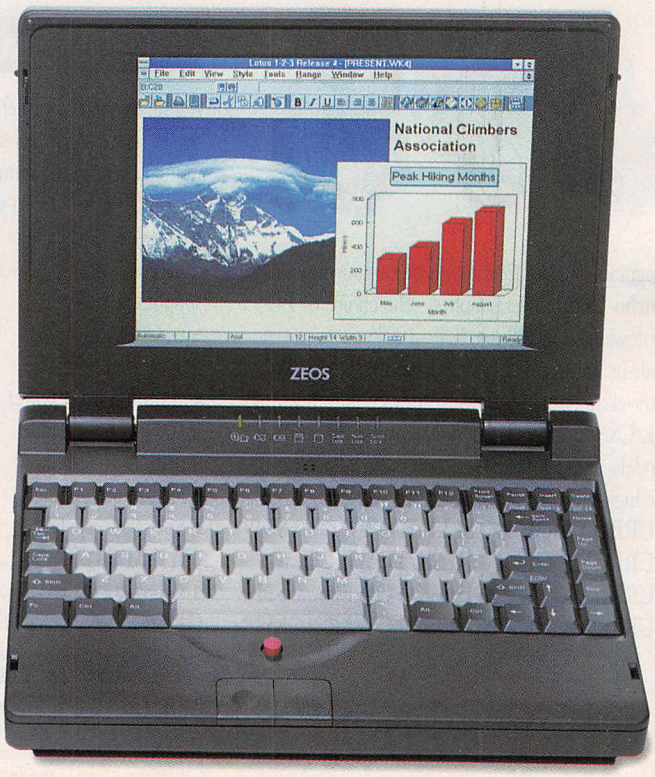
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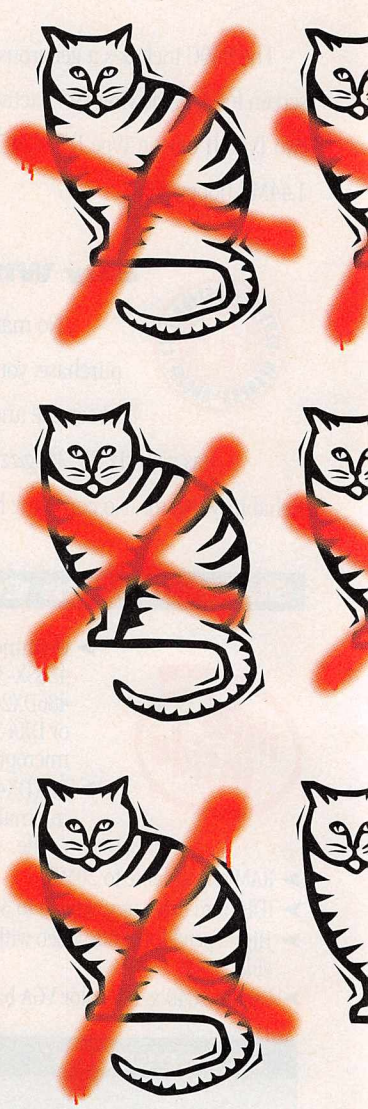
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386-based PCs



486-based PCs

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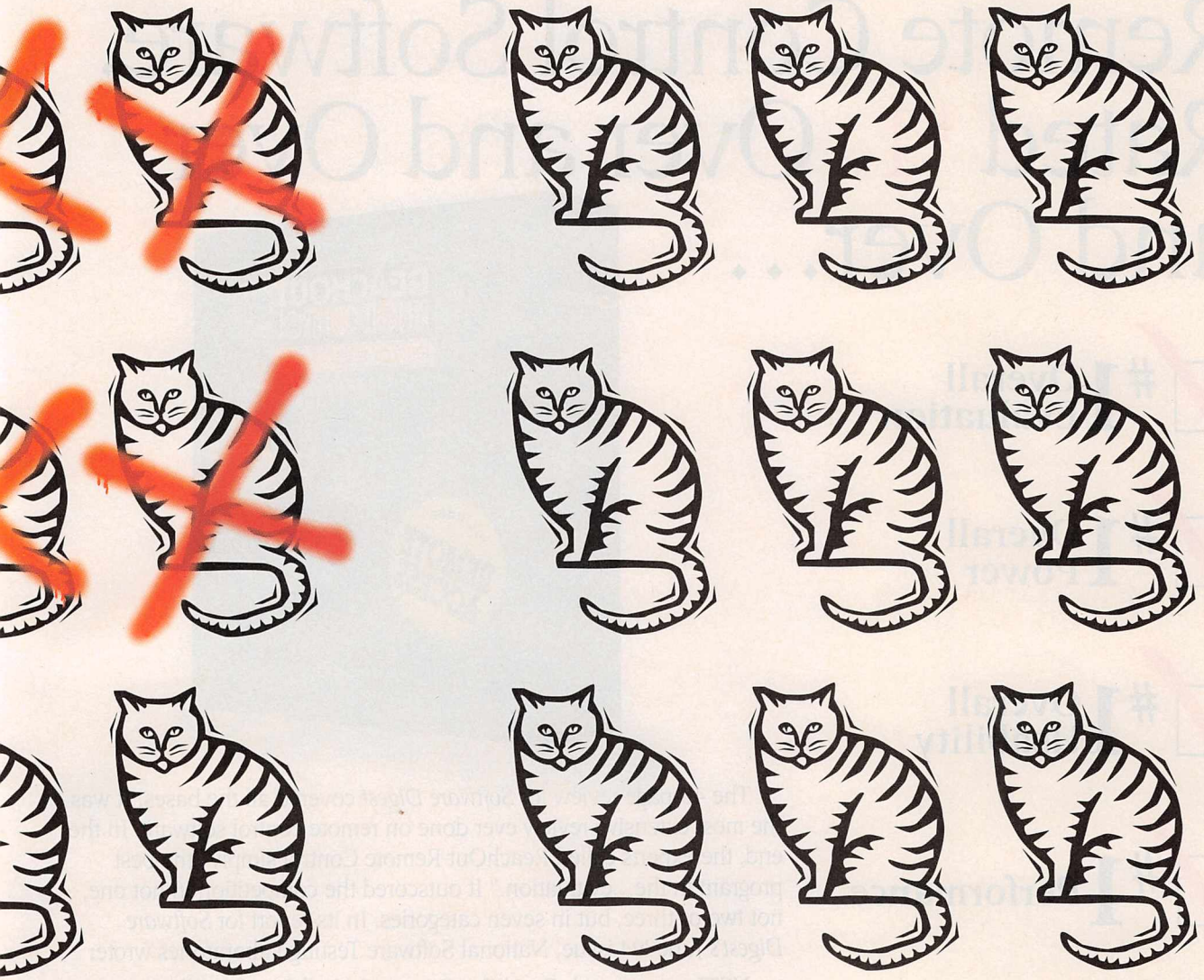
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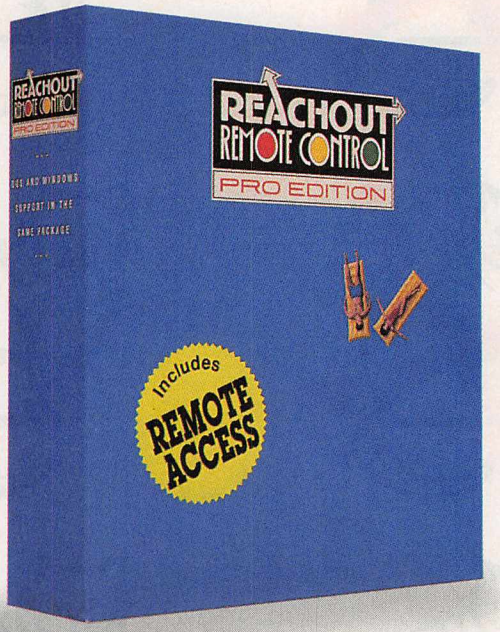
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NSTL recommends ReachOut Remote Control for its excellence in almost every category. No other program matches its number of features or ease of use, and it is the unanimous choice for best program in the testers' general usability evaluation.

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That's the vision IBM Software Manufacturing Solutions and Hughes Network Systems has for DirecPC, a one-way, nationwide satellite system for delivering software to retail stores and large corporate buyers, as well as transmitting news broadcasts and Internet files. Think of the instant gratification of downloading a file from the Internet at 12 megabits per second (90MB per minute). That's a twentyfold increase over the speed of a 14.4 modem, which takes 20 minutes to download a 2MB file; a satellite can beam the same file in a minute.

"A year ago this technology didn't exist," says Jack Malone, senior director of marketing at Hughes. DirectPC costs $1,495 for the 24-inch dish, add-in board, and software, plus $15.95 per month. Since the satellite is receive-only, however, you'll still need a modem to handle all outbound calls.

Dubbed *digital object delivery,* Hughes's satellite service not only gives software manufacturers a new way to distribute software, updates, and fixes, but also gives content providers a way to deliver full-motion video and multimedia information to the desktop. Satellites are also being used to deliver video to PCs. CNN and Intel recently debuted CNN at Work, a news service delivered to corporate networks over cable or satellite.

While Hughes is leveraging its Galaxy IV satellite (orbiting 22,000 miles above the earth) for its DirectPC system, other long-term projects are underway. Motorola's Iridium and Bill Gates/Craig McCaw's Teledesic are both low-earth orbiting satellite systems (about 500 miles above the earth) that provide two-way communications.



Satellites already deliver information to notebooks equipped with a Global Positioning Satellite (GPS) PCMCIA receiver that determines your notebook's speed, altitude, and location—useful for surveyors, appraisers, and others who handle documents that need instantaneous and exact location information. The GPS satellite antenna, a low data rate device, is about the size of a baseball. Higher data-rate devices need bigger antennas to provide signal-to-noise ratios for faster signaling.

Will other wired alternatives such as cable prove more economical? We won't know that for another decade.—*Frank J. Derfler, Jr., and Carol Levin*

Illustration by Garry Nichols

Dial-Up Banking? Wait till Next Year

ON-LINE BANKING HAS BEEN around in various guises for more than a decade, yet few PC users take advantage of it. Intuit estimates that only 2 percent of Quicken users pay bills electronically. Despite a recent flurry of acquisitions and pending mergers, the future of on-line banking is still something of a question mark.

Today, on-line banking services offer bill-paying, electronically delivered credit card statements, and direct connections to banks for viewing balances, making transfers, and downloading transactions for reconciliation. (For evaluations of personal finance software, see "Seizing Control of Your $$$" in this issue.)

Revenue potential from on-line banking is extraordinary. That's why banks are lining up behind the major players in personal finance software—and why each developer is trying to snare a piece of the action for itself. Microsoft Money has added Chase Manhattan as its fourth bank to offer on-line access to account information and fund transfers. If Money moves to Novell after a Microsoft-Intuit merger, these customers and banks will move with it.

MECA, rather than centralizing on-line banking through a financial service (as Money does, using National Payment Clearinghouse), is building custom versions of Managing Your Money for clients like Nationsbank and Visa, which will then offer on-line services to customers.

Block Financial has made on-line balance and transaction review available to holders of the CompuServe Visa card through its Conductor Card Review on CompuServe. Intuit, which was quiet about its on-line banking plans even before the merger with Microsoft was announced, has assembled the infrastructure for bringing more services in-house.

More PC users will have the opportunity to try on-line banking soon. Richard Bray, group product manager for personal finance at Microsoft, put it bluntly: "A year from now more people will be using these services. But do I expect this to be a mass market product a year from now? No."—*Gregg Keizer*

Pipeline *By Robin Raskin*

Don't Let a Little Paranoia Spoil a Good Thing

This is a story of how good products can lead to bad business decisions. It's the story of how Microsoft's newly created Developer Division will make a valiant attempt to bring a cross-platform software development tool to the market, only to have its efforts usurped by other forces in the company. And it's a story that raises more serious questions about Microsoft's business practices.

First, the cheerful news: The Developer Division is a welcome addition to Microsoft's organizational chart. It's responsible for marketing Microsoft tools (Visual Basic, Visual C++, Access, and FoxPro), for evangelizing Microsoft solutions such as OLE and Windows, and for disseminating information and training to developers.



The effort comes at a time when Microsoft tools have matured considerably. The newest incarnation of C++ reduces difficult jobs (such as creating 32-bit OLE applications) to manageable tasks. The Microsoft Foundation Class (MFC) libraries are state of the art.

Now the Developer Division is tackling cross-platform development. Microsoft is well positioned for success here: There are no good solutions available. Bedrock, the code name for the cross-platform solution from Apple and Symantec, was yesteryear's hope; Lotus and WordPerfect play their cross-platform tools close to the chest (read: proprietary); and the largest segment, the Macintosh development community, has enough trouble keeping their own developers from hitting brick walls.

Microsoft already enjoys some success in the cross-platform arena. So in its infinite wisdom, the company decides to take the strategic cross-platform tools of the Microsoft Applications Group (Word, Excel, and Office) and turn them into a product.

So far, so good. The Developer Division arranges with the Microsoft Applications group to turn their cross-platform code into products. The new products—Visual C++ for MIPS, Alpha, and Macintosh—are all based on code developed by the Microsoft Applications Group. And the stuff works well.

What's the rub? Well, the Microsoft Applications team is just a little nervous about giving up its best technology and its competitive edge. As a defense, the team has struck a deal with the Developer Division: Visual C++ Macintosh users (as well as MIPS and Alpha users) can distribute free runtime versions, unless they happen to be in the spreadsheet or word processing business. Such direct competitors will need to call Microsoft and work out a redistribution fee.

This is a terrible business decision. First of all, what are these guys worried about? Lotus has already said it's not developing for the Macintosh applications market anymore. And WordPerfect already has a Macintosh product. If Microsoft really believes that it has the best spreadsheet and word processor on the market, then it should be willing to run the risk that this will remain so, despite the selling of some of its development tools.

According to Cameron Myhrvold, director of marketing of the Developer Division, it makes perfect sense to ask the Applications Group's biggest competitors to help Microsoft recoup the cost of its development effort. While I recognize the need for Microsoft to protect its investments, I can't understand why it would enter into a market where it sets up unfair practices to sell the product. At a time when Microsoft, more than ever, needs to be above reproach in its business practices, it's gone and done it again.

Robin Raskin is the editor of PC Magazine.

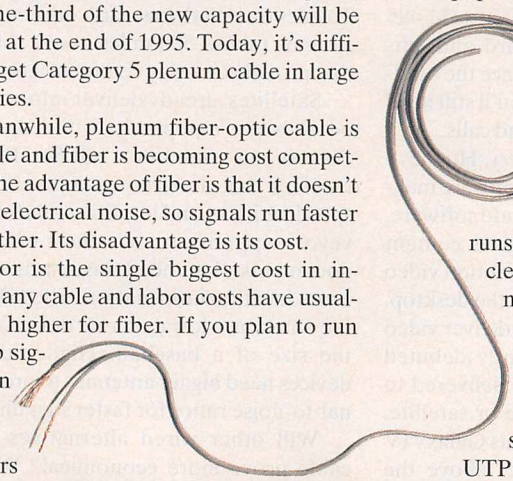
Teflon Shortage Casts New Light on Fiber

REMEMBER FIBER-OPTIC CABLE? Maybe the long-distance telephone companies like it, but we don't need it for LANs, do we? New network signaling technologies such as 100VG and 100BaseT can use unshielded twisted-pair (UTP) copper wire to get 100-megabit-per-second throughput, so who needs fiber? The answer: Maybe you do. The laws of supply and demand are in force and a shortage of specific types of UTP and other developments are making fiber attractive again.

Category 5 plenum cable—UTP wire which falls in the highest category—is designed to run in building air ducts, and it uses DuPont FEP fluoropolymer resins in its covering. The cable manufacturers conducted expensive smoke and flame tests to get these cables certified for use in buildings. But now the DuPont resin, part of the Teflon family, is in short supply. DuPont has a $150 million upgrade project underway at the factory that produces the covering, but only one-third of the new capacity will be on-line at the end of 1995. Today, it's difficult to get Category 5 plenum cable in large quantities.

Meanwhile, plenum fiber-optic cable is available and fiber is becoming cost competitive. The advantage of fiber is that it doesn't absorb electrical noise, so signals run faster and farther. Its disadvantage is its cost.

Labor is the single biggest cost in installing any cable and labor costs have usually been higher for fiber. If you plan to run 100-Mb signals on UTP, the installers must follow strict procedures and then use special equipment to certify the cables. In contrast, fiber installations require less labor. On the fiber side, new crimp-on connectors introduced by AMP have reduced the amount of time, training, and equipment needed for installation.



The DuPont resin used in network cabling is in short supply.

Today, you might pay 30 to 60 percent more for a 300-foot run of fiber than you would pay for the same run of Category 5 plenum UTP, but the costs quickly level out on longer runs. Beyond 300 feet, fiber is the clear choice because it doesn't need the repeaters required by UTP to boost the signal.

If you're planning a new LAN cable installation during 1995, it's wise to insure your supply of Category 5 plenum UTP and give strong consideration to using fiber-optic cable in all the hub-to-hub connections.—*Frank J. Derfler, Jr.*

The Death of the Battery Beep

LIFE IS TOO SHORT, BUT BATTERY life is way too short. Portable computing's most pesky milestone remains unreached: You still can't count on a full day of usage without a recharge. In a push to make 1995 the year the battery beep dies, industry players are working on marrying new notebook and battery designs with two existing battery technologies—lithium ion and zinc-air.

Lithium ion isn't new, but it's increasingly the front-runner in the battery technology race. Toshiba's T3600CT and Dell's Latitude XP notebooks squeeze up to 6 hours of life out of lithium ion batteries. The batteries also offer about 1,000 recharges.

Six hours of charge will suit a coast-to-coast flight but not a full day. Gary Elsasser, manager of product planning for Toshiba's notebooks, says that notebook design innovations, not battery chemistry, will push battery life to 10 hours and beyond. "Just a couple of years ago, we had 10-watt screens; now our Portégé has a 3-watt screen," he says. "We'll design our way to 10 hours in a matter of months." Toshiba gets its lithium ion batteries from Sony and also has joined with Asahi to manufacture the batteries.



AER's supercharged Power 220 weighs 6 pounds, but it's said to be on a crash diet.

The problem is that system power draw is a moving target. AER Energy in Smyrna, Georgia, is betting on zinc-air batteries to come to the rescue. Although most batteries depend on chemicals reacting together in a sealed unit to result in a charge, zinc-air batteries use oxygen from air that's fanned in to support reactions that generate electricity. AER's $649 Power 220 Zinc-Air battery will run a PC and cellular phone concurrently for an an eye-popping 20 to 30 hours.

But don't whip out your wallet just yet: The Power 220 battery is the size of a large hardback novel, weighs 6 pounds, and can withstand only about 200 charge cycles. Frank Harris, vice president of marketing for AER Energy, says these limitations are beatable. "We have a similar battery in prototype that's the size of the footprint of a notebook computer and a quarter of an inch thick," says Harris. "It is about a pound and improves on the charge cycle limitation." A pound isn't much to pay for a 24-hour battery, design permitting.—*Sebastian Rupley*

Pixel-Packing Polysilicon Panels

THESE DAYS, EVERYONE WANTS to make a better flat-panel display. While Japanese manufacturers supply the vast majority of notebook displays, the U.S. government is investing heavily in the development of advanced displays as part of its defense conversion project.

Among the technologies under development are field-emission, electroluminescent, and polysilicion displays. Most recently, In Focus Systems, a maker of LCD projection panels in Wilsonville, Oregon, and the David Sarnoff Research Center in Princeton, New Jersey, formed Sarif Inc. to develop active-matrix polysilicon displays.

Displays made with polysilicon can reach a resolution on the order of 1,280-by-1,024; that's over 1 million pixels. By comparison, the best notebook displays on the market today offer 800-by-600 resolution.

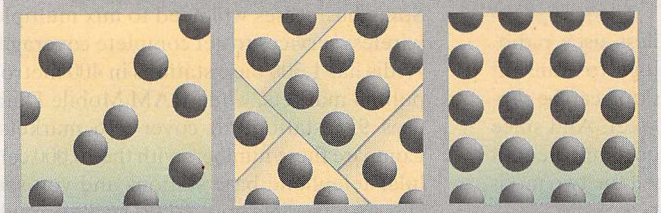
The performance difference is due to the limitations of amorphous silicon. This material differs from *single-crystal* silicon used in microprocessors. Think of single-crystal silicon as a sugar crystal, perfectly ordered and highly conductive. This makes the circuitry fast. Amorphous silicon, in contrast, is similar to powdered sugar. This is a low-resistance state and unsuitable for building fast microprocessors. Flat-panel displays are made with amorphous silicon because glass cannot stand the temperatures that are required to deposit crystalline silicon.

If the glass panel is replaced by a quartz panel, then the temperature the silicon is deposited at can be much higher, and the silicon becomes semi-crystalline, a form known as polycrystalline. In this state, abutting mini-crystals have a conductivity midway between single-crystal and amorphous silicon. Displays built using polycrystalline technology are suitable for high-resolution displays.

Since polycrystalline technology is not as mature as amorphous technology, polycrystalline displays measure only 2 inches diagonally. Sarif expects to have its first image engine ready early next year.—*Howard Pein*

Silicon States

Amorphous silicon has limited efficiency because of its random structure. Polycrystalline silicon, composed of abutting minicrystals, is more responsive, because electrons can flow through it at a higher rate. Single-crystal silicon is the most conductive material used to build microprocessors.



Top Retail Software

Current ranking	Last issue	Product/ company
1	—	**Headstart Turbo Tax Federal '94** *Intuit*
2	1	**MS-DOS 6.22 Upgrade** *Microsoft Corp.*
3	—	**WinCheckIt 2.0** *Touchstone Software*
4	—	**MS Works 3.0 for Windows with Money 3.0 for Windows** *Microsoft Corp.*
5	4	**Procomm Plus for Windows 2.0** *Datastorm Technologies*
6	—	**QuickBooks 3.0 for Windows** *Intuit*
7	—	**Resume Writer 1.0** *Expert Software*
8	—	**WinFax PRO 4.0 for Windows** *Delrina Corp.*
9	6	**MS Office 4.2 for Windows Upgrade** *Microsoft Corp.*
10	—	**Do It Yourself Lawyer for Windows** *Expert Software*

This list ranks PC business programs according to the total number of copies shipped to over 12,000 stores and resellers in the week ending October 29, 1994; the list cannot be interpreted as a picture of the entire software market. Sales information adapted from a compilation by Ingram Micro.

Untether Yourself...

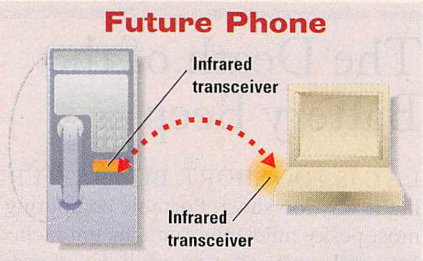
WANT TO MAKE '95 THE YEAR YOU finally free yourself of those cumbersome cables? There's a close-range wireless technology that's poised to make it happen: infrared, the same technology built into the TV remote controls of channel-surfing couch potatoes everywhere.

While infrared technology has enabled products such as Sharp Wizards and HP OmniBooks to exchange data for some time now, you could only share data between products from the same family. The widespread acceptance of the new IrDA standard—set by Walnut Creek, California's Infrared Data Association—has made infrared a wireless Esperanto. Consider this: Microsoft is supporting the IrDA standard with a driver in Windows 95. Hewlett-Packard has armed its new printers with multiple IrDA-standard infrared transceivers that enable untethered PDA and notebook users to beam files to printers up to 10 feet away. Likewise, several phone giants (including British Telecom, Japan's NTT, and Canada's Northern Telecom) are working on infrared transceivers and printers for payphones—allowing you to share data between your notebook or PDA and a remote PC.

Microsoft is a key force behind the acceptance of the IrDA standard. Rogers Weed, group manager of Microsoft's Personal Systems Division, calls Windows 95's IrDA-compatible driver "the operating system's first truly far-reaching attempt to enable portables, desktops, and printers to communicate wirelessly."

Infrared still has significant limitations. The most troubling are range and speed. The technology remains line of sight, although IBM, Texas Instruments, and others are working on diffuse infrared. The IrDA standard calls for devices to have an operating range of 39 inches. The standard also calls for a maximum data transfer rate of 115 kilobits per second—half the speed of a floppy disk drive. IBM, though, has surpassed that data transfer rate with its new 755CE and 755CD ThinkPads, which transfer data at 1.15 megabits per second.

Global wireless networks and wide-area wireless solutions such as CDPD are long-term threats to line-of-sight technologies. In the meantime, while standards wars get fought and global networks slouch toward arrival, the close-range wireless technology that's already arm's length from couch potatoes everywhere is on its way to PCs, phones, and printers everywhere.—*Sebastian Rupley*



Three major telecommunications companies are designing pay phones with infrared transceivers, so you can send and receive e-mail or data files wirelessly.

...and Your Network

TO STRETCH YOUR HORIZONS PAST your immediate surroundings, you'll need wide-area network (WAN) wireless technology. Both RAM Mobile Data USA LP (800-726-3210) and Ardis (800-662-5328) deliver mature wireless WANs. But they'll face increasing competition from Cellular Digital Packet Data (CDPD) networks, which piggyback on today's cellular phone system, and Ricochet Micro Cellular Data Network from Metricom (800-556-6123), which is based on low-cost, low-power base stations.

Before you plug your PC into a wireless WAN, consider the limitations of these networks. Wireless WAN devices provide lower-speed access (4.8 Kbps) than wire-bound modems (28.8 Kbps) and speeds well below the 1 Mbps to 2 Mbps of wireless LAN devices. Moreover, advertised throughput numbers rarely hold up. Even analog cellular modems work best at about 4.8 Kbps—half their rated capability. Out on the horizon is the 19.2 Kbps promised for CDPD, and the 56 Kbps promised for Ricochet.

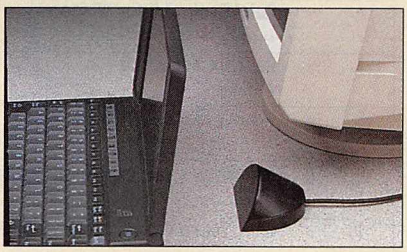
With a wireless WAN service, you can access nationwide networks that cover about 30 to 40 percent of the country and up to 90 percent of major metropolitan locations. Even where a vendor promises complete coverage, there will be spots where the network drops out. Deep hollows and areas around power lines are notorious for gobbling up wireless signals. WAN base stations typically can reach several miles; LAN base stations rarely exceed 300 feet. (For more information, see "No Strings Attached" in this issue.)

The location of the base station is critical. Some businesses will need to mix multiple wireless services to get complete coverage. Ardis has 1,300 base stations in 400 metropolitan markets, while RAM Mobile Data uses 925 stations to cover 216 markets. Compare these numbers with the 10,000 cellular telephone base stations and you see why many people hope CDPD will succeed.

Even with complete coverage, the appeal of wireless nationwide communications is worth more to some people than it is to others. Ideally, access costs and subscription fees should be affordable. But for now, even the lower-cost services remain too expensive for casual use.—*Gary Gunnerson*

Synchronicity: *Notebook to Desktop*

If you use both a notebook and a desktop computer, managing files can be a chore. You're always moving files between the two, and it's tough to synchronize data on both machines. LapLink Wireless with AirShare RF ($299.95), from Traveling Software (800-343-8080), and JetEye LT ($199), from Extended Systems (800-235-7576), use Traveling Software's LapLink Remote Access software to synchronize files.



Since LapLink Wireless uses radio-frequency (RF) technology to transmit data, your laptop and desktop can be separated by as much as 30 feet. And since RF can turn corners, you don't need a direct line of sight between the two modules. The downside is that these RF modules require external power.

JetEye LT's low-power infrared technology draws all the power it needs through the serial port connection. It has just one limitation: It uses line-of-sight wireless technology.

Extended Systems is also introducing two other wireless products: JetEye PC ($135) for desktop connections, and JetEye ($179) for printer connections. Both are IrDA-compatible.—*Robert P. Lipschutz*

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2062

First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

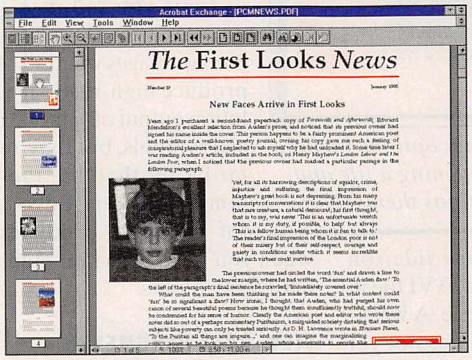
■ **Electronic Publishing**

Acrobat 2.0: The Source for All-Purpose Portable Documents

BY EDWARD MENDELSON

Adobe Acrobat 2.0 makes electronic publishing software simpler, more trouble-free, and more flexible than ever, with the ability to create complicated and rich documents and distribute them freely across a variety of computer platforms.

More than ever, Acrobat is an all-purpose tool for producing electronic documents. The program now supports a variety of file types, and accessing files (to view a video clip or modify a spreadsheet, for example) is only a mouse click away. By adding a freely distributable reader program that lets you circulate Acrobat files everywhere and the ability to index documents for rapid searching, Acrobat 2.0 does more than address Adobe's missteps with the initial version of this program: It sets the standard for others to follow.



VIEW: *Acrobat's reader displays thumbnails and zoomable views, but you first have to create the thumbnails by giving a command from a menu.*

Acrobat is composed of several independent programs that together form the most flexible electronic publishing program available. The basic reader software is now free (the Version 1.0 reader cost $50), and can be downloaded from most on-line services as well as Adobe's Internet server. This program will let you read Acrobat files, but won't let you add notes or modify files. The reader in the $195 Acrobat Exchange package goes several steps further by letting you add notes and links, crop and rotate images, and add and remove pages. Also included in the Exchange package is a printer driver that makes saving a file in Acrobat's Portable Document Format (.PDF) as

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■ **17-Inch Monitors**

New Displays for NEC and Sony Widen Your View

BY BRAD STILWELL

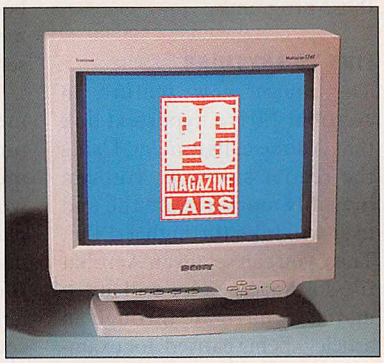
The 17-inch monitor market has reached a crossroads in terms of features, price, and technology. Several monitors are aimed at the mainstream buyer, to whom value and a good image are of equal importance. Others aim higher, offering superior features that will appeal to those with more demanding uses in mind, such as computer aided design and image processing.

Monitors such as NEC's $1,295 MultiSync XP17 are feature-rich, technologically savvy, and ergonomically correct. Others, such as Sony's $999 Multiscan 17sf, are built to lure users who want larger viewing areas and can live without all the expensive bells and whistles.

SONY MULTISCAN 17SF

Despite its attractive list price, the Multiscan 17sf has an uncompromised picture size. Its 16.1-inch diagonally measured viewing area is one of the largest you'll find among 17-inch monitors. In comparison, NEC's MultiSync XP17 measures only 15.6 inches diagonally.

The Multiscan 17sf is one of the few 17-inch monitors that is restricted to a resolution of 1,024-by-768, which it runs at 76 Hz. It also lacks the sophisticated controls that have become common on larger monitors, such as tilt, convergence, or degaussing. The lack of these controls makes the occasional fine-tuning of the image impossible for this monitor. Also, the unit's push-button controls adjust your image in inflexible increments.



BUDGET VIEW: *Sony's Multiscan 17sf combines a large viewing area with a hard-to-beat price.*

We noticed that the focus of the Multiscan 17sf's 0.25-mm

Continues on page 39

Photography by Thom O'Connor

Adobe Acrobat

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easy as clicking on any application's Print menu.

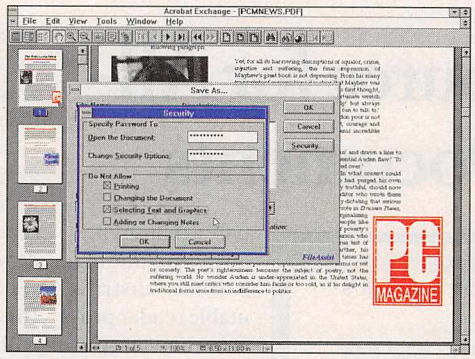
The $595 Acrobat Pro package includes the Acrobat Distiller, which lets you convert PostScript print files into .PDF files. We found the Distiller useful when working with applications designed to create PostScript output or when including encapsulated PostScript images or true-color graphics in a .PDF file. It was able to correctly process several complex files in which the standard Acrobat printer driver mistakenly produced overlapping text. With Acrobat 2.0, you can print directly from Windows applications to the Distiller (unlike Version 1.0, which forced you to print to a file first).

The $1,595 Acrobat for Workgroups includes a ten-user license for the reader and the Distiller, as well as a copy of Acrobat Catalog. The Catalog program, which is also available separately from Adobe for $500, gives users the ability to create full-text indexes of .PDF files. Although these indexes can be used by the reader included with Acrobat Exchange and Acrobat Pro, they can't be created by those programs.

LINK TO ANYTHING

The major new feature in Acrobat 2.0 is a hypertext link that Adobe calls *articles*. Using the reader software, you can invisibly mark a route the end user will take through a .PDF. Thus, you can set up an Acrobat file so that a reader will automatically navigate through an article—being carried, for example, from the foot of one column to the top of the next.

You can create standard hypertext links not only within individual .PDF files but also between separate .PDF files and to external programs. External links let you launch other Windows programs or play sound or video clips simply by clicking on a word or region in a .PDF file. By manually editing a .PDF file, you can specify that different files will run when you click on the link in different platforms—a QuickTime video on the Macintosh or an .AVI file in Windows, for example. A weakness is that Adobe has not yet documented the commands required to do so.



LOCK-OUT: *Acrobat's security options include separate passwords for opening a file and changing the security options themselves.*

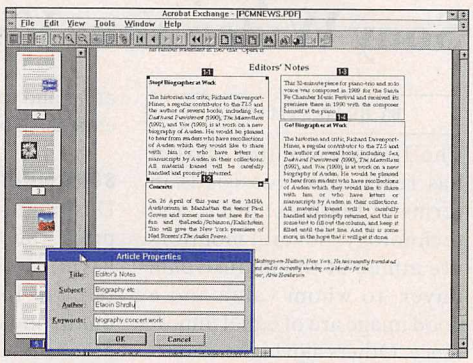
Other navigational aids and markup tools in Acrobat include pop-up notes with customizable title bars and colors, hierarchical tables of contents, and the ability to view thumbnails of each page. By moving a small frame over a page's thumbnail, you can zoom in on the position to be viewed without manipulating the scroll bars.

The basic Find menu now supports strings of more than one word but is painfully slow sifting through large files. The faster and more advanced Search menu, which uses indexes created by Adobe Catalog, is a plug-in module—the first of many due over the next year.

As powerful and polished as Version 2.0 of Acrobat is, its font handling still requires a lot of manual intervention for the best possible results—although Acrobat handily does a better job than the competition (Farallon's Replica 1.0.1, No Hands Software's Common Ground 1.0, and Novell's WordPerfect Envoy 1.0) Acrobat can embed both TrueType and Type 1 fonts for guaranteed font fidelity, and it automatically creates bitmap images of fonts you tell it not to embed. These bitmap images won't produce high-resolution output of special symbols, but they're far better than the random characters Envoy, for example, produces when you work with non-standard Type 1 fonts.

VIEW-ONLY DOCUMENTS

When you save text to the clipboard from an Acrobat file, it's saved in Rich Text Format (.RTF), so fonts and basic page formatting are preserved when the text is pasted into other applications. Acrobat's security features include separate passwords for opening a file and changing security options themselves. Files can be designated as view-only, which prevents users from printing, annotating, or copying to the clipboard.



BOOKMARK: *When you build an article in Acrobat using linked paragraphs or images, you can also create keywords for finding the article later.*

The sole weakness in Acrobat's plethora of functions is that it tends to be slower at creating and viewing files than less ambitious products like Replica or Envoy. We found the difference to be generally small, and the flexibility and reach of Acrobat more than compensates.

Acrobat is available on all major platforms. Macintosh and Windows versions come in the same box; Version 2.0 for Unix is due later this year. Support for DOS, however, will lag behind the other platforms, as Acrobat 1.0 for DOS won't be upgraded to Version 2.0. The DOS 1.0 viewer displays Acrobat 2.0 files, albeit without access to special 2.0 features like articles and external links.

If Acrobat seems an expensive proposition, small organizations with limited electronic publishing needs may be content with the no-frills $99 Replica. And the upcoming release of Common Ground 2.0—with Distiller-style PostScript support and full-text indexing—promises to offer Acrobat serious competition.

Yet not even Common Ground is likely to dislodge Adobe's .PDF format from its status as the industry-standard portable format. And with Version 2.0 and its unique navigation features, Acrobat remains the first choice for creating, viewing, and annotating portable documents.

▶ **Adobe Acrobat 2.0.** List price: *Acrobat Exchange, $195; Acrobat Pro, $595; Acrobat for Workgroups, $1,595.* Requires: *4MB RAM (8MB for Distiller and Catalog programs), 5MB hard disk space, Microsoft Windows 3.x.* Adobe Systems Inc., *Mountain View, CA; 800-833-6687, 415-961-4400; fax, 415-961-3769.*

Circle 435 on reader service card

FIRST LOOKS PLUS

From December 19 to 23, you can go on-line to download Adobe Acrobat Reader 2.0 or discuss the product with reviewer Edward Mendelson and Acrobat product manager Rob Babcock. Type GO EXEC at any CompuServe ! prompt.

17-Inch Monitors

CONTINUED FROM PAGE 37

aperture-grill Trinitron CRT starts to appear fuzzy at the screen's corners. For most uses, such as word processing or spreadsheet work, this lack of uniform sharpness probably won't even be noticed. But for demanding image or design uses, this monitor may not suffice. Using Sonera Technologies' DisplayMate Professional, we also found prominent moire patterns on the fine-line moire test.

The overall performance of the Multiscan 17sf was excellent, but there was one caveat. Compared with the 17-inch monitors we reviewed in "The Bigger Picture" (September 27, 1994), the Sony unit had a below-average score (44 percent) on our modulation transfer function test (MTF), which measures a monitor's sharpness.

Other than that, the Multiscan 17sf's scores, including those on our misconvergence and spatial uniformity tests, were excellent, and its color-tracking score was the best we've seen.

It also powered down to 4.8 watts at idle mode, easily meeting the EPA's Energy Star requirement (30 watts), as well as the more stringent Nutek standard (8 watts). The Multiscan 17sf was also well within the MPR-II guidelines for electromagnetic and radiation emissions (see benchmark test).

The Multiscan 17sf will tempt many mainstream users to shelve their 14- and 15-inch monitors and seek a display that has more active viewing space to work with.

NEC MULTISYNC XP17

In contrast to the Multiscan 17sf, the MultiSync XP17 is aimed at a more discriminating audience and has features that surpass those of other 17-inch monitors. The inclusion of ACCESS.bus and a plethora of controls and adjustments make this NEC monitor a joy to work with.

The significant news is that the MultiSync XP17 has ACCESS.bus compatibility, a feature that lets you add peripherals without needing to install drivers or reboot your PC. You can plug up to 125 devices—such as a keyboard, mouse, scanner, printer, or other I/O device—directly into the monitor using the ACCESS.bus converter kit (price to be determined).

NEC also offers a model without the ACCESS.bus: the MultiSync XE17, which sells for $235 less than the MultiSync XP17. Designed for those who don't need ACCESS.bus connectivity, the MultiSync XE17 will be an ideal choice as a high-end 17-inch monitor.

The MultiSync XP17 has the most extensive on-screen menu controls we've seen. There's a row of buttons along the bottom of the monitor that make it look as if you probably need a PhD in electronic engineering just to use it. But with menus that take you through the adjustment process, the MultiSync XP17 is actually easy to use. Beyond the basic adjustments for size, positioning, pincushioning, barreling and color matching, the MultiSync XP17 has controls for tilt, alignment, rotation, and vertical linearity. An upper- and lower-bow balance control even lets you adjust the top and bottom halves of the screen separately. While push buttons on the front panel control all on-screen image adjustments, the XP17 retains thumb wheels for contrast and brightness, as well as a manual degaussing button. Together, these controls allow the knowledgable monitor user to make the image as close to perfect as possible.

NEC includes Sonnetech's Colorific calibration software, a precision color-matching program that keys your screen's colors to printer output. NEC also includes software-based on-screen adjustments for ACCESS.bus users and software that can program your monitor to warm up and power down at preset times.

Aimed at high-end graphics, engineering, and CAD users, the MultiSync XP17 supports refresh rates of 76 Hz at 1,280-by-1,024 resolution and 90 Hz at 1,024-by-768 in noninterlaced modes.

An above-average performer on most tests, the MultiSync XP17, which is based on a 0.28-mm dot-pitch shadow mask tube, earned better pincushioning, brightness, spatial uniformity, and color tracking scores than its predecessor, the MultiSync 5FGp.

However, we noticed that the MultiSync XP17 lacks the sharpness of the best monitors we've seen. It earned an average score of 48 percent on our MTF measure of display sharpness. In power-saving mode, the MultiSync XP17 reduced its draw to 7.9 watts in idle mode, easily meeting both Energy Star standards and the tougher-to-meet Nutek power-conservation standards. The MultiSync XP17 also easily met the MPR-II guidelines for magnetic emissions.

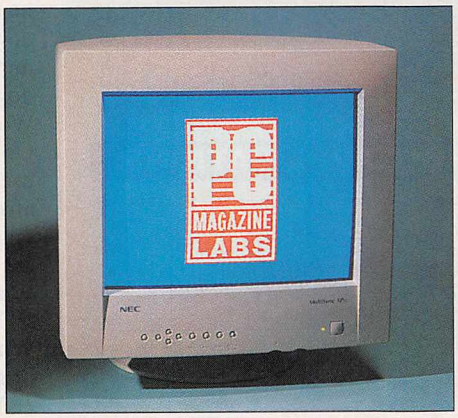
The Sony Multiscan 17sf and the NEC MultiSync XP17 are built to appeal to different buyers. Once you've decided that a 17-inch monitor is the way to go, the only choice becomes which end of the market you shoot for. The Sony Multiscan 17sf is a great display that has more active viewing area than any other 17-inch monitor available. The NEC MultiSync XP17 goes a step further, with a nearly infinite degree of adjustment options and a lot of flexibility.

▶ **Multiscan 17sf.** List price: *$999.* Sony Electronics Inc., *San Jose, CA; 800-352-7669, 408-894-0225; fax, 408-955-5171.*

Circle 430 on reader service card

▶ **MultiSync XP17.** Estimated street price: *$1,295.* NEC Technologies Inc., *Wood Dale, IL; 800-388-8888, 708-860-9500; fax, 708-860-7973.*

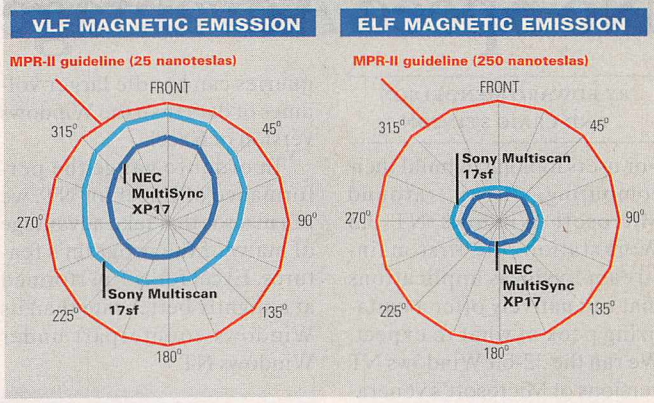
Circle 431 on reader service card



HIGH-END: *NEC's XP17 monitor has excellent image quality and on-screen controls.*

Benchmark Tests: 17-Inch Monitors

Both 17-inch monitors, the Sony Multiscan 17sf and the NEC MultiSync XP17, were well within the range for compliance with the MPR-II emissions guidelines. On both of our emissions tests, the NEC monitor had lower emissions at all angles.



■ Windows NT Applications

32-Bit Excel and Word Offer No Speed Advantage

BY EDWARD MENDELSON AND CRAIG STINSON

For users looking to build their computing lives around Microsoft Windows NT 3.5 Workstation, the first mainstream business applications that run natively offer a tantalizing peek at what to expect. We ran the 32-bit Windows NT versions of Microsoft's venerable Windows programs Excel 5.0 and Word for Windows 6.0 through their paces and found that they trailed the 16-bit (Windows 3.1) versions considerably in terms of performance.

Because Windows NT's interface is nearly identical to what you find with Microsoft Windows 3.1 and Microsoft Windows for Workgroups, the Windows NT versions of these applications look and feel like their Windows counterparts—with one important exception: The Windows NT applications can handle filenames up to 255 characters long. These descriptive names can be applied to both FAT and NTFS volumes, and because Windows NT automatically generates eight-character aliases, users on other platforms can still access files.

EXCEL 5.0 FOR WINDOWS NT

Microsoft Excel 5.0 for Windows NT confers a handful of modest benefits, the most important being its increased robustness. If you run Excel under Windows 3.1 and another application crashes, the Windows operating system can collapse like a house of cards. If you run Excel for NT, you avoid this risk.

Also, for users who manipulate large worksheet databases, Excel for NT's pivot tables and queries can handle larger volumes of data than the Windows version of Excel.

In order to gauge the performance of Excel for NT, we ran macros that take advantage of many of the program's features. Excel for NT performed at a slightly better rate than its Windows counterpart under Windows NT.

If you don't need long filenames or large on-sheet queries, or if you haven't been nettled by crashing Win16 applications, you may be better off waiting to see what Microsoft delivers next.

WORD FOR WINDOWS NT 6.0

Microsoft Word for Windows NT 6.0 looks and acts almost exactly like the Windows 3.1 version of the same application. The only difference most users will notice is that default settings are stored in the Windows NT Registry instead of by Word.

Microsoft makes much of the fact that Word for NT is a Win32 application, recompiled for a 32-bit operating system. On our tests, the 16-bit version of Word running under Windows for Workgroups produced the fastest results, followed by the same application running under Windows NT. By far the slowest combination was Word for NT running under Windows NT.

The only feature in Word for NT that offers superior performance is its ability to run printing as a separate thread in the background. But because Windows for Workgroups already allows printing to occur in the background, using a separate thread in Windows NT doesn't create dramatic improvements. Until Microsoft uses separate threads for spell-checking, graphics import, repagination, and other major operations, Word for NT won't get much of a chance to outperform its 16-bit sibling.

WHY SLOWER?

These 32-bit applications ran slower than their 16-bit counterparts for two reasons. First, the Windows 3.1 versions of Excel and Word represent several years of optimization and fine-tuning. By contrast, these are the initial Windows NT releases of existing applications; they can be expected to be a bit rough around the edges. They should improve over time, however. Until Microsoft has more experience compiling applications for 32-bit systems, the tried-and-true 16-bit applications will most likely continue to give superior performance.

Second, the Windows 3.1 version of Excel uses sections of assembly coding to access the system directly, which speeds things up considerably; this is not allowed under Windows NT.

If long filenames and the increased robustness that Windows NT brings to the party are important to you, these Windows NT versions of Excel and Word for Windows make sense. On the other hand, if you plan to use Windows NT for what you already do in Windows 3.1, it might make more sense to wait for the next generation of Windows NT applications.

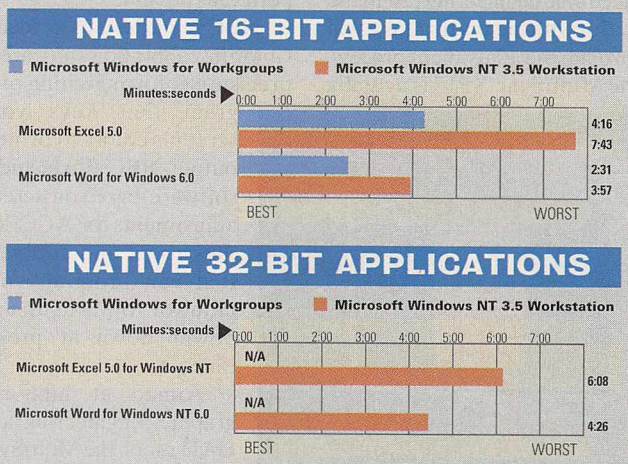
► **Microsoft Excel 5.0 for Windows NT.** List price: *$339; upgrade, $129.* Requires: *12MB RAM (16MB recommended), 8MB hard disk space, Microsoft Windows NT 3.5.* **Microsoft Word for Windows NT 6.0.** List price: *$339;* upgrade, *$129.* Requires: *12MB RAM (16MB recommended), 8MB hard disk space, Microsoft Windows NT 3.5.* Microsoft Corp., *Redmond, WA; 800-426-9400, 206-882-8080.*

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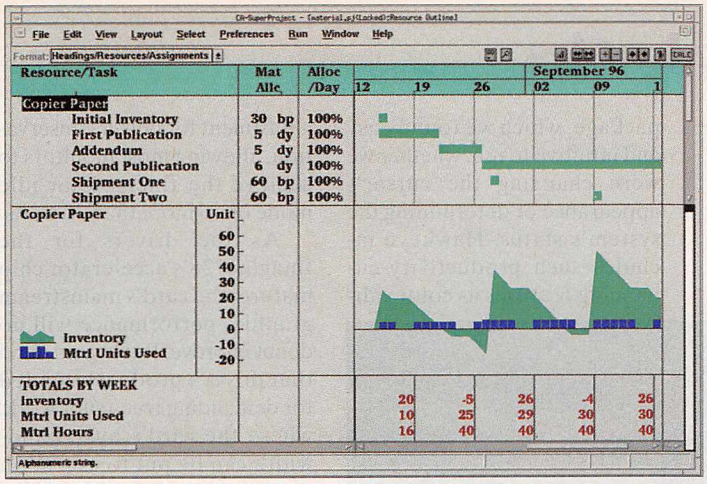
Benchmark Tests: Microsoft Windows NT Applications

In general, we found that these first Windows NT 3.5 versions of Microsoft Excel and Microsoft Word for Windows did not perform as well as the Windows 3.1 versions of the same programs. Word for NT, for example, was slightly slower than its 16-bit cousin. Excel for NT, however, was about 20 percent faster than its 16-bit counterpart under Windows NT.

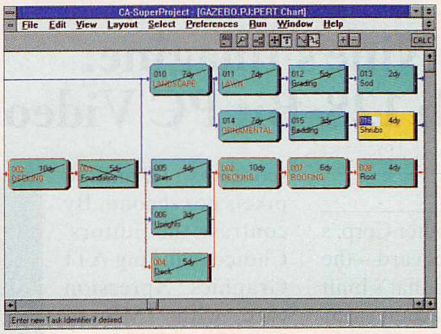
We ran the same macros on the Windows NT 3.5 and Windows 3.1 versions of Excel 5.0 and Word for Windows 6.0 on a 486DX/33 PC with 16MB of RAM.



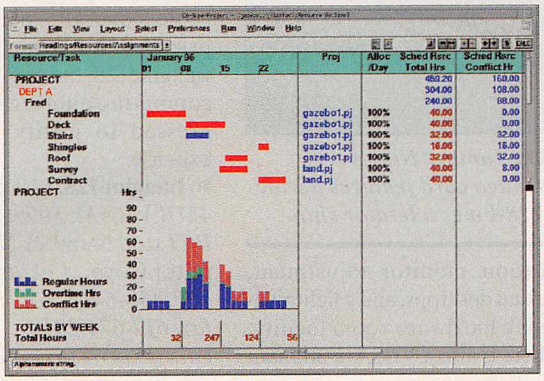
N/A–Not applicable: 32-bit Windows NT applications will not run under Microsoft Windows for Workgroups.



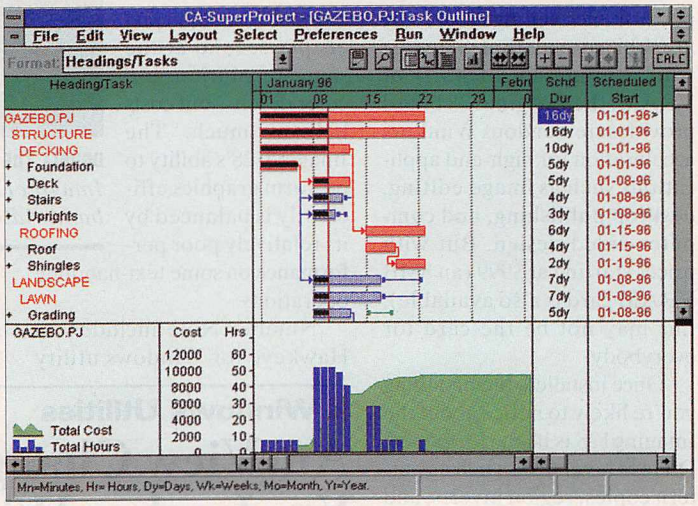
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Video

Number Nine's Imagine: First with 128-Bit PC Video

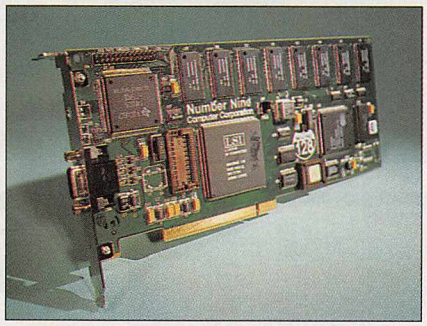
BY JON HILL

Number Nine Computer Corp.'s Imagine128 graphics card—the first PC video board that's built around a 128-bit accelerator chip—has opened a hole in the performance ceiling created by its 64-bit competition. Shipping with a minimum of 4MB of VRAM, the Imagine128 board provides tremendous Windows acceleration for high-end applications such as image editing, desktop publishing, and computer-aided design. But with prices starting at $999 (an 8MB VRAM card is also available), this may not be the card for everybody.

Once installed, the first thing you're likely to notice about the Imagine128 is its performance: On low-level tasks such as pattern copies, region inverts, and polygon generation, the Number Nine card is 1.5 to 7 times as fast as its nearest 64-bit competitor. This is the result of two factors: the video chip's ultra-wide 128-bit path between the graphics accelerator and video memory, and the board's unique memory architecture, which gives the system's processor and the graphics chip simultaneous access to the frame buffer.

Overall, performance on mainstream Windows tasks (as measured by Winbench 95, Version 1.0) was very good, but the board has clearly not been optimized for general-purpose computing. On our Hewlett-Packard Vectra XU test-bed (equipped with a 90-MHz Pentium and 16MB of RAM), the PCI-bus Imagine128 card managed a Graphics WinMark 95 score of 9.9 million pixels per second at a resolution of 1,024 by 768 pixels in true-color mode, one of the highest scores so far for this test. In 800-by-600 resolution and 256-color mode, its score was 11.9 million pixels per second. By contrast, the Editors' Choice–winning ATI Graphics Xpression card with 2MB of DRAM achieved a score of 9.1 million pixels per second at the same resolution and color depth—but costs half as much. The Imagine128's ability to perform graphics efficiently is balanced by its relatively poor performance on some text-handling operations.

Number Nine includes its Hawkeye for Windows utility package, which we found easy and intuitive to use, whether we were changing the cursor's appearance or determining the system's status. Hawkeye includes such productivity-enhancing features as color calibration, monitor adjustment, virtual desktops, and a lightning-quick hardware zoom facility. There is also a VESA-compliant adjustment for power conservation, allowing most monitors to achieve the Energy Star idle mode of no more than 30 watts.



DOUBLE THE FUN: *Number Nine's Imagine128 video card features a wide-bandwidth 128-bit accelerator chip.*

As the drivers for the Imagine128's accelerator chip mature, the card's mainstream graphics performance will no doubt improve. But bear in mind that this is a product intended for demanding true-color work, where the card's huge bandwidth can be put to use. With several video cards with comparable overall performance priced a lot lower than the Imagine128, the majority of the computing public will be hard pressed to justify the extra expense.

▶ **Imagine128.** List price: *With 4MB VRAM, $999.* Requires: *PCI slot.* Number Nine Computer Corp., *Lexington, MA; 800-438-6463, 617-674-0009; fax, 617-674-2919.*

Circle 425 on reader service card

Windows Utilities

AnyView Changes the Way You Look at Windows

BY J.W. OLSEN

At an attractive $49, AnyView Professional, from Binar Graphics, provides Microsoft Windows 3.1 users with video features expected in Windows 95—plus some tricks of its own.

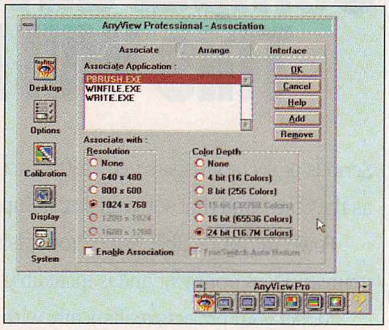
AnyView's most exciting feature is its ability to instantaneously switch between resolutions and color depths without requiring you to restart Windows; a click on the program's floating toolbar is all it takes. We also found it easy to associate specific resolutions and depths with different Windows applications so that, for example, our e-mail program was set to run in 640-by-480 mode with 16 colors, while our graphics application was set to 1,024-by-768 resolution with true color. The change is automatic.

If your hardware supports it, you can also have a larger virtual desktop and can zoom in on any area of it. The zoom feature is invoked by clicking on the AnyView icon. The virtual desktop is automatic: Move your cursor off the screen on a spreadsheet and AnyView moves the display accordingly.

The real payoff from AnyView is performance. Not only does the program increase the speed at which screens are displayed,it also optimizes Windows' memory. The result is that you can run more simultaneous tasks with the same amount of memory. And if that still doesn't suffice, a click on Recover Lost Memory frees stray bits of memory that prior tasks failed to give up. This allows you to open and close applications and reuse more memory.

We did encounter several minor problems during testing, however, including the odd placement of some icons, minor color shifts, and fuzzy fonts when switching resolution. Some programs, such as Microsoft Word for Windows, Version 6.0a, refused to recognize the resolution change.

Overall, AnyView Professional is a handy utility that makes managing different color depths and resolutions in Windows easy.



HAVE IT YOUR WAY: *Instantly switch screen resolutions and color depths.*

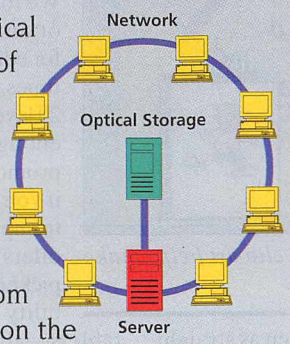
▶ **AnyView Professional.** List price: *$49.* Requires: *4MB RAM, 2MB hard disk space, Microsoft Windows 3.1.* Binar Graphics Inc., *San Rafael, CA; 800-228-0666, 415-491-4182; fax, 415-491-1164.*

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QStar (Unix)	**Sarek Software** (Windows, Novell)	**Hi-Arc Software** (Sun)
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Illustration

SmartSketch Turns Ideas into Drawings

BY ERYN BROWN

Attention, graphics users frustrated by the current crop of illustration software: FutureWave Software's $99 SmartSketch may be the drawing program that best fulfills the needs of the business user, while giving more than a nod toward an artist's sensibility.

Installation is simple and fast. An interactive tour through the product launches immediately after installation, allowing you to play around with some of SmartSketch's more advanced features.



EASY ART: *Drag-and-drop clip art helps make SmartSketch easy to use.*

The help menu provides access to EasyArt, over 600 pieces of standard-fare clip art, which can be accessed by subject. EasyArt lives up to its name: It features drag-and-drop positioning, and its keyword indexing is simple to understand. Another useful feature, the Assistant dialog box, lets you customize automated features such as straight line, curved line, and shape recognition depending on the precision of your drawing skill. We found the basic tools easy to use; the best way to get to know SmartSketch is to experiment with features like the brush size and shape options.

The addition of object-oriented editing lets your creativity expand with your level of sophistication, although there are limits. We found selecting pieces of an ungrouped object for editing to be difficult at times. Still, the program's 20 levels of undo provided enough peace of mind to promote exploration, and if you have the hardware to support it, the package offers a 16.7-million-color picker as well as compatibility with digitizing tablets—although it does not support pressure sensitivity. The program is an OLE 2.0 client and server, and you can opt to install the SmartSketch icon in Microsoft Word or Microsoft Excel; SmartSketch supports .DXF, .WMF, and EPS file formats.

For business users, and especially those who want to stretch their drawing horizons, SmartSketch does the trick.

▶ **SmartSketch.** List price: *$99.* Requires: *4MB RAM, 1.5MB hard disk space (7MB recommended), Microsoft Windows 3.1 or later.* FutureWave Software Inc., *San Diego, CA; 800-619-6193, 619-637-6190; fax, 619-637-9032.*

Circle 424 on reader service card

FIRST LOOKS PLUS

From December 12 through 16, you can go on-line to download a trial version of SmartSketch and to discuss the program with reviewer Eryn Brown and her guests, Michelle Welsh, VP marketing, and Jonathan Gay, VP development, of FutureWave, publishers of SmartSketch. Type GO EXEC at any CompuServe ! prompt.

Windows Graphics

Jasc Media Center Organizes Multimedia

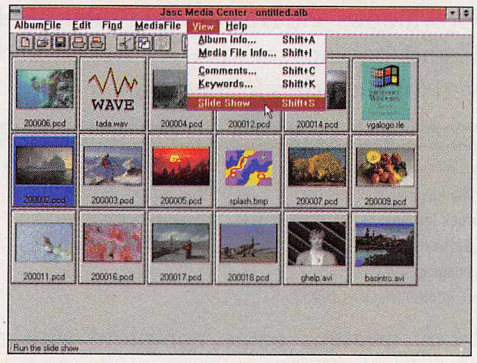
BY J.W. OLSEN

JASC, best known for its Paint Shop Pro image capture and conversion utility, is putting the emphasis on the *multi* in multimedia with its Jasc Media Center, Version 2.0 (formerly called ImageCommander). This $39 program lets you catalog the sights and sounds of multimedia while organizing all the related files into logical albums.

After opening an album, you add files either by specifying them by name or by telling Media Center to catalog the material based on the file type. We were able to catalog an entire hard disk with just a few mouse clicks. And with support for more than 30 image formats, as well as .WAV and MIDI sound files and .AVI and .FLC/.FLI video files, versatility is Media Center's strength.

We found that reordering the thumbnail placeholders for images and sounds by dragging them to new positions was easy and intuitive. You can also sort album contents automatically by any of ten useful criteria, including filename, date, disk on which the files reside, image resolution, and size. As with most image-cataloging products, you can copy, delete, print, and rename the thumbnails. But because Media Center incorporates Paint Shop Pro's conversion engine, you can convert image file formats on the fly without switching applications.

Actually displaying a file's contents is also easy. Double-clicking your left mouse button on a thumbnail displays the image or plays the sound file. Double-clicking the right button calls up the default image or sound editor you've assigned to the thumbnail's file type. At this point, we found we could add comments and keywords to thumbnails for later retrieval. You can also run slide shows, complete with background music and transition effects.



MIX & MATCH: *Jasc Media Center can organize images, sounds, and animation within the same album.*

Media Center automatically keeps track of file locations on removable disks such as floppy disks and CD-ROMs—a definite plus. When you click on a thumbnail to view or play its file, you're prompted to insert the correct disk. The product ships with 100 rather pedestrian clip-art images and, more important, with an exceptionally detailed and well-written 100-page manual.

If you've been looking for one tool to manage diverse types of multimedia files, Jasc Media Center may end your search.

▶ **Jasc Media Center, Version 2.0.** List price: *$39.* Requires: *4MB RAM, 3MB hard disk space, Microsoft Windows 3.1 or later.* JASC Inc., *Minnetonka, MN; 800-622-2793, 612-930-9171; fax, 612-930-9172.*

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PC MAGAZINE EDITORS' CHOICE
March 16, 1993
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■ RISC

NiTro-VLB: Are You Ready To RISC Your PC?

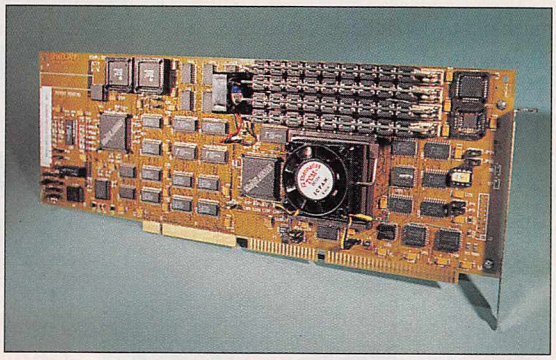
BY DAVID WILSON

ShaBlamm Computer's NiTro-VLB Windows NT Booster is a convoluted name for a novel product that can convert most VL-Bus PCs into MIPS R4600-based Windows NT workstations. The NiTro-VLB card, which contains a RISC processor and fast memory, can not only stretch your present system into a powerful RISC-based workstation that will run DOS, Windows, or Windows NT, it can also act as a bridge to the future of computing. However, with a price that's at roughly the level of a Pentium PC, the conversion kit is not for everyone.

ShaBlamm makes boards with 100-MHz, 133-MHz, and 150-MHz MIPS processors. The most unusual feature of the NiTro-VLB board is that all three models use very fast zero-wait-state system memory. Called True-Cache Main Memory by ShaBlamm, this architecture is based on 15- nanosecond memory chips that run at the same speed as the MIPS processor. The result is that the system's memory and CPU are in sync and accessing memory is not a bottleneck to performance; thus, there is no need for external cache. Alternatively, you can use standard off-the-shelf PC memory chips, but the performance will not be as good. With standard DRAM memory, the system memory is constrained by the motherboard; with the NiTro-VLB board, you're limited to 32MB of system memory.

We looked at ShaBlamm's $2,445 basic NiTro-VLB Windows NT Booster, which contains a 133-MHz R4600 processor. Included with this board is Microsoft's Windows NT 3.5 Workstation operating system for the MIPS processor and 16MB of system memory. The board as tested had 32MB of RAM, which costs an additional $1,050.

Installation of the card is fairly simple. The board is inserted into any VL-Bus slot that has an empty adjacent slot. The system starts up its native Intel processor into DOS, and then loads a series of ShaBlamm utilities and Windows NT onto the system's hard disk. Setup and configuration took about 15 minutes and was uneventful. We used a 33-MHz 486DX PC as our base system for testing.



CONVERT: *ShaBlamm's NiTro-VLB Windows NT Booster turns an Intel PC into a MIPS-based workstation running Microsoft Windows NT.*

DUAL-PERSONALITY PC

In normal operation, DOS starts and executes its normal AUTOEXEC.BAT file, which launches Windows NT. At that point, the machine changes its personality from an *x*86/DOS personal computer to a MIPS-based Windows NT machine. Because of the dual boot process—first *x*86 running DOS, then R4600 running Windows NT—startup can be annoyingly slow. But once Windows NT 3.5 is running, the host PC/ShaBlamm board combination looks and feels exactly like any other workstation operating under Windows NT.

Windows NT contains an Intel *x*86 emulator, so you can install and run your favorite DOS and Windows programs (although there will be a performance penalty), as well as MIPS-specific Windows NT programs.

Compared with a previously tested Deskstation Technology system with a 133-MHz R4600 processor using Windows NT 3.1, we found performance of the two systems to be similar, though not identical. On simple tasks, the two systems were on the same level of performance. On more complex tests, the PC using the ShaBlamm NiTro-VLB board was up to 20 percent faster than the Deskstation Technology machine. This appears to be a result of the 15-ns main memory found on the ShaBlamm NiTro-VLB board, which effectively acted as a huge external cache; the Deskstation system had 512K of external cache.

The disk performance picture is less clear. The ShaBlamm NiTro-VLB board achieved comparable performance levels for sequential write and random read operations. But the sequential read and random write performance levels with the ShaBlamm NiTro-VLB board were significantly lower than those achieved by the Deskstation Technology system. Overall, it was a wash between the systems in terms of disk performance.

The ShaBlamm NiTro-VLB system under Windows NT was 1.5 to 3 times as fast as a 60-MHz Pentium PC on fixed-point and floating-point processor tests. Because of the differences in the DOS emulators present in Windows NT 3.1 and Windows NT 3.5, no meaningful comparisons could be made between the ShaBlamm NiTro-VLB card and the Deskstation system. The NiTro-VLB–based system was able to run DOS and Windows programs on a par with a 486SX CPU running at from 25 to 33 MHz.

INTERESTING, BUT...

The ShaBlamm NiTro-VLB board is an interesting concept that has been well engineered and implemented, but is seemingly destined for niche markets. While the board runs well and reliably, it requires a VL-Bus–based motherboard, which is increasingly losing ground to PCI bus designs. Ultimately, the ShaBlamm concept may be the answer to a question few people have asked, because at $3,500, you're halfway to the cost of a full MIPS-based workstation. On the other hand, the board will be an effective way for a Windows NT programmer to cross over between Intel and MIPS development platforms.

For those who need to move from the Intel world running DOS and Windows to the MIPS world operating in Windows NT, the ShaBlamm NiTro-VLB conversion board is a unique product that solves some very difficult problems well.

▶ **NiTro-VLB Windows NT Booster.** List price: *With MIPS 133-MHz R4600 processor, 32MB RAM, and Microsoft Windows NT 3.5, $3,495.* Requires: *PC with VL-Bus slot, 4MB RAM, 200MB hard disk space.* ShaBlamm Computer, *Cupertino, CA; 800-742-2526, 408-730-9696; fax, 408-730-4940.*

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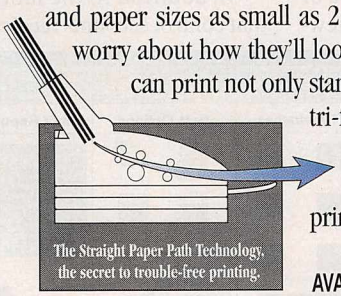
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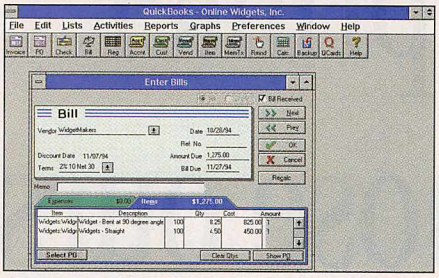
CIRCLE 208 ON READER SERVICE CARD

Accounting

QuickBooks: Intuit Does Inventory

BY THERESA W. CAREY

There's good news for operators of small businesses who are trying to make do with spreadsheets or pencils and ledger paper to maintain their financial records. Get rid of your green eyeshades: The current version of Intuit's QuickBooks now handles inventory management as well as a host of new features, including audit trail and customizable invoices. The result is that QuickBooks leads the pack in the small-business accounting market.



SPLIT: *QuickBooks allows you to enter purchases as they are received.*

Inventory management has traditionally been a difficult task, but QuickBooks makes it relatively easy. Unique among other accounting programs, QuickBooks offers a variety of ways to enter purchased items. You're not forced to go through a preset series of steps, creating fake purchase orders or bills along the way to fit an accounting program's inflexible procedures. The most useful addition we found was the ability to record the arrival of several elements of a single invoice as they are received, rather than waiting for the complete order to update inventory records.

QuickBooks maintains its forms-based metaphor for entering transactions in this version. Checks, purchase orders, invoices, and bills are all entered onto screens that mimic the program's forms. There are also more ways to customize forms in this version. It was easy to choose which fields are to be included on an invoice and edit the labels, choose fonts, or add a company logo. Although you can't view the selected fonts and logos during data entry, you can view them using the Print Preview function.

The beauty of this product for accounting novices is that QuickBooks lets you completely avoid words like "debit" and "credit" unless you seek them out. If you need to make special adjusting entries—depreciation, for example—you can do so by making a General Journal entry in the Special Transactions area. Your accountant will be glad that the program can maintain an audit trail for any data entry errors that occur, though we found that adding audit tracking slowed down transaction processing.

To process payroll, you still need Intuit's QuickPay add-on program. And though Version 3.0 of QuickBooks includes many enhancements, we found several missing elements. The inventory section does not include back-order processing and only maintains a single price for each item (though you can override it during invoice entry). You can customize invoices, but you can only have one invoice layout in use at a time; therefore, you can't create unique invoices for each customer or group. For those using the DOS version of QuickBooks, there's bad news: Intuit has no plans for an upgrade, but will continue supporting Version 2.0 for DOS. You can easily upgrade from Version 2.0 for DOS to Version 3.0 for Windows, but check over the lists created after the upgrade: Many of your vendors and customers will be classified as "other."

QuickBooks 3.0 for Windows is a solid performer. If you've got simple inventory management needs and don't want the complexity of a higher-end system, this program is a good choice.

▶ **QuickBooks 3.0 for Windows.** Estimated street price: *$99; upgrade, $25 to $35.* Requires: *4MB RAM, 10MB hard disk space, Microsoft Windows 3.1 or later.* Intuit Inc., *Menlo Park, CA; 800-624-8742; 415-322-0573.*

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Accounting

Ca$hGraf: One-Stop Business Books

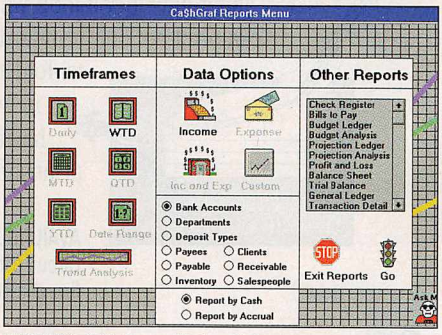
BY ELLEN DEPASQUALE

The strengths of Ca$hGraf Business Plus, Version 3.0, are its ease of data entry and retreival, as well as its one-stop approach to accounting for the midsize company.

As more and more non-accountants take to the keyboards, it's important that the software they use offers them the information they need to manage a business. The $299.95 Ca$hGraf fits the bill by achieving a good balance between simplicity, power, and the ability to create custom graphs and reports.

Designing a custom graph or report in Ca$hGraf is easy: Just click on a few icons that describe the information and how it is to be presented, then wait to view the results. And after you've produced the graph, radical changes can still be made. There is an icon bar at the bottom of the screen that allows alterations to time frames and the type of graph. For instance, after viewing a graph of income for the month to date, a quick click can change the graph to show week-to-date income, or convert it from a pie chart to a bar graph.

Ca$hGraf can produce reports for both cash- and accrual-based accounting. This is an outstanding and unique feature for smaller companies that file their taxes based on cash accounting, but still want to maintain up-to-date accounts receivable and payable balances.

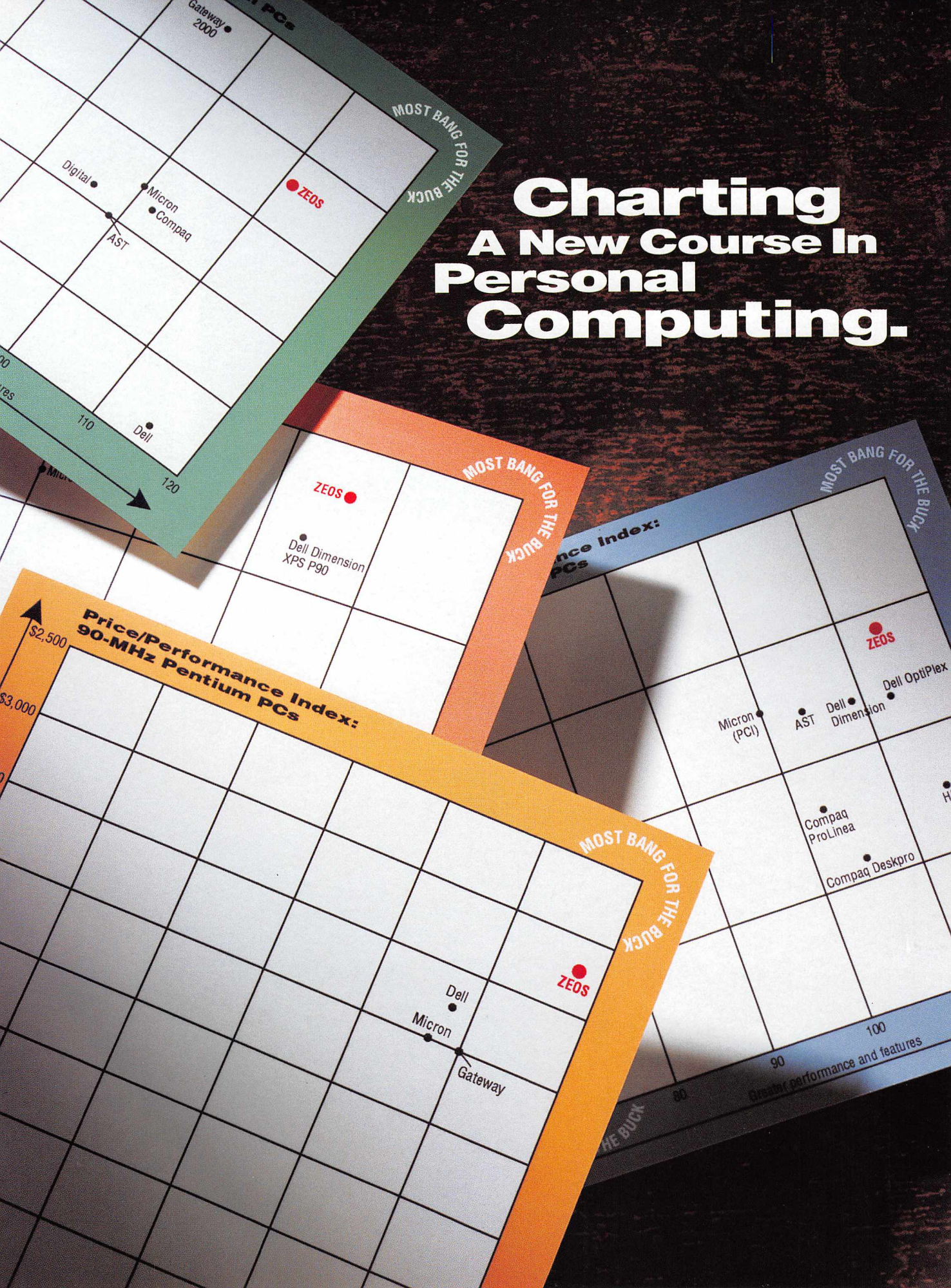


DISPLAY: *With a click of the mouse, Ca$hGraf can produce custom reports.*

CASH OR ACCRUAL

To choose a cash- or accrual-based report, select the appropriate button during the initial report design, or make the choice from the icon bar on the graph. We found that this is an excellent way of changing perspective—from a cash point of view to accrual or vice versa—while viewing data.

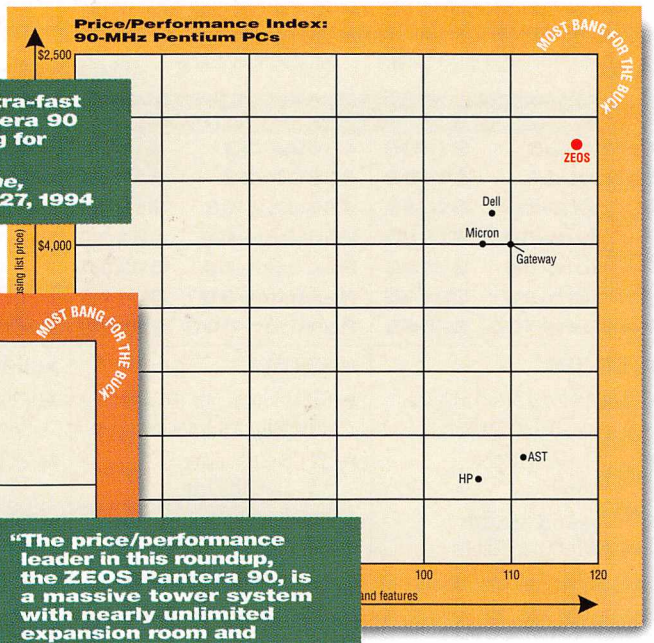
In addition to the modules that control accounts receivable, accounts payable, and inventory, Ca$hGraf has the capability—with some setup and extra effort—to do payroll. There are several extras, including a word processor, a database, a day planner, and a contact manager. This combination goes a long


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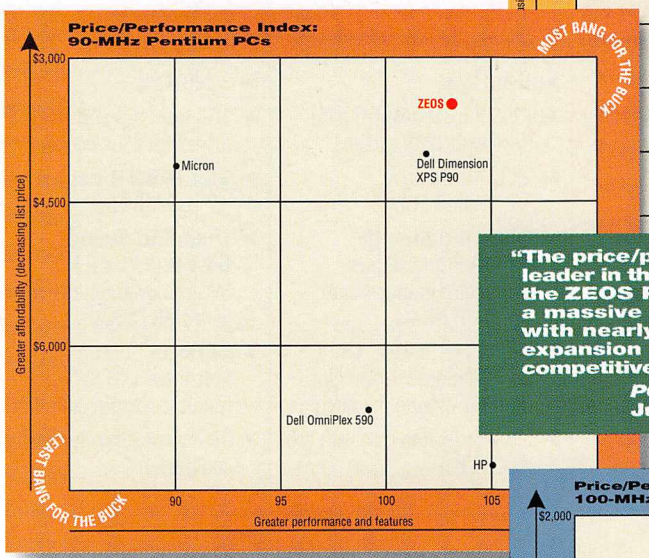

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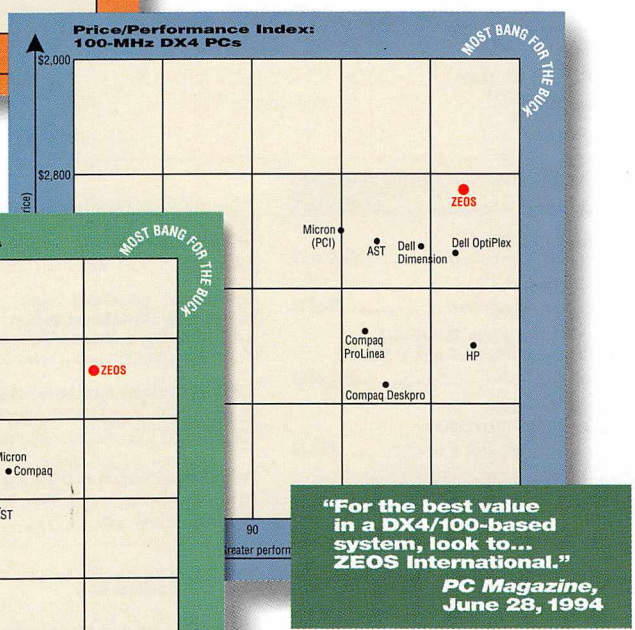
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"In this roundup of ultra-fast PCs, the ZEOS Pantera 90 offers the most bang for the buck."
PC Magazine, September 27, 1994



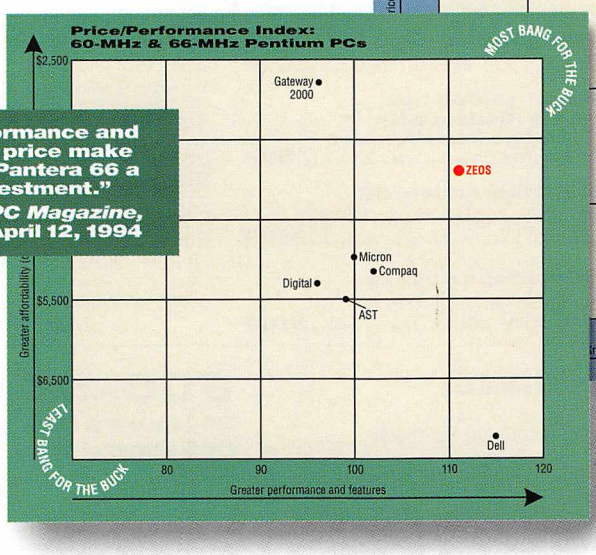
"The price/performance leader in this roundup, the ZEOS Pantera 90, is a massive tower system with nearly unlimited expansion room and competitive performance."
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"For the best value in a DX4/100-based system, look to... ZEOS International."
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PC Magazine, April 12, 1994



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486DX2-66
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Time after time, the ZEOS Pantera has been tested against the competition, repeatedly beating all others hands down. In *PC Magazine*'s price and performance comparisons of technologically-advanced systems from primary computer companies, ZEOS is the unbeatable value.

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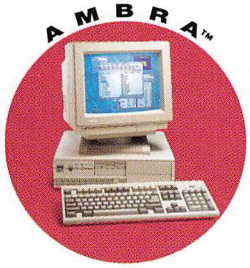
- 8MB RAM
- 528MB local bus IDE hard drive
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- Diamond Stealth 64-bit PCI local bus SVGA graphics card with 1MB DRAM
- 14" SVGA color monitor
- 6-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse

486DX2-66 $2295
Pentium-60 $2595

Top Gun:

The above system modified to include:

- 128K SRAM cache (486) 256K SRAM cache (Pentium)
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM
- 15" SVGA color monitor upgrade
- 14.4/14.4 send/receive fax modem
- Lotus SmartSuite



486SX-33 $1195

Package #1:

- 4MB RAM, 128K SRAM cache
- 214MB hard drive
- 3.5" 1.44MB floppy drive
- VESA local bus SVGA color video
- 14" SVGA color monitor
- 4-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse



Pentium-66 $2845
Pentium-90 $2995

Editors' Choice:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM upgrade
- 15" SVGA color monitor
- 6-bay desktop case
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Lotus SmartSuite

Pentium-66 $2995
Pentium-90 $3195

Hottest Pantera:

The above system modified to include:

- 1GB local bus IDE hard drive
- 6-bay desktop case (Pentium-66)
- 10-bay vertical case (Pentium-90)



DX4-100 $3095

Package #3:

- 8MB RAM
- 350MB IDE hard drive
- External 3.5" 1.44MB floppy drive
- STN color VGA 7.9" display
- Custom carrying case
- Extra battery
- MS-DOS, Windows for Workgroups
- Lotus Organizer
- 7.8" x 10.2" x 1.7"; 3.9 lbs.



Pentium-66 $3418
Pentium-90 $3568

Best MM:

- 16MB RAM, 256K SRAM cache
- 528MB local bus IDE hard drive
- 2X CD-ROM drive, 3.5" 1.44MB FDD
- 16-bit sound card, stereo speakers
- Diamond Stealth 64-bit PCI local bus graphics card with 2MB VRAM upgrade
- 17" SVGA color monitor
- 10-bay vertical case
- MS-DOS, Windows for Workgroups, Microsoft Mouse
- Lotus SmartSuite

Pentium-90 $3995

Best MM Supreme:

The above system modified to include:

- 24MB RAM
- 1GB local bus IDE hard drive
- 4X CD-ROM drive, 3.5" 1.44MB FDD
- Altec Lansing high-power speakers



DX4-100 $3295

Package #3:

- 8MB RAM
- 350MB IDE hard drive
- Internal 3.5" 1.44MB floppy drive
- Dual-scan color VGA 10.3" display
- Custom carrying case
- Extra battery
- MS-DOS, Windows for Workgroups
- Lotus Organizer
- 8.9" x 11.7" x 1.9"; 6.3 lbs.

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Purchase orders are subject to approval. Business leasing programs available. Lease prices based on a 36-month lease; 10% purchase option. All prices, specifications and availability are subject to change without notice; call to confirm these and warrant y details. Prices do not include shipping. Novell compatibility is Developer Tested Only. Novell makes no warranties with respect to this product. All products and company names are trademarks or registered trademarks of their respective holders. Intel Inside and Pentium Processor Logos are trademarks of Intel Corporation. ZEOS is a registered trademark; Computers Now! is a registered servicemark; Pantera, Ambra, Freestyle and ZEOS Meridian are trademarks of ZEOS International Ltd. © 1995 ZEOS International Ltd., 1301 Industrial Blvd., Minneapolis, MN 55413 USA. ZEOS is a publicly traded company (NASDAQ symbol: ZEOS).

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way toward making Ca$hGraf the one program small- to medium-size companies can use for all their needs. In addition, Ca$hGraf can import files from other accounting packages (including Intuit's QuickBooks for Windows, Microsoft Profit, Peachtree Accounting for Windows, and BestWare's M.Y.O.B. Accounting) or through an ASCII-delimited text file.

But the best thing about Ca$hGraf is its nonthreatening quality. Tommy, the friendly face that appears on almost every screen, is your path to the help menu. The program includes a 90-minute instructional videotape and a package of microwaveable popcorn.

DOLLAR-CENTRIC

The two potential problems we found concern Ca$hGraf's inability to deal with international currencies and the fact that it can't prepare a true chart of accounts. Similar to Intuit's QuickBooks, Ca$hGraf uses categories, or departments, to post the transactions. For example, paying the electric bill would post to the checking account and the Utilities Expense account.

However, a standard chart of accounts would associate a number with the posting account. It is obvious that Ca$hGraf was designed for the nonaccountant preparing a small business's books. If the user is not accustomed to using account numbers, it may be easier to learn to post by department name from the start.

Ca$hGraf is a strong contender in the midrange accounting market, and should be very appealing to business operators who need real bookkeeping, but don't have the time or inclination to read the manual.

▶ **Ca$hGraf Business Plus, Version 3.0.** List price: *$299.95.* Requires: *4MB RAM, 11MB hard disk space, Microsoft Windows 3.1 or later.* Target Software Group Inc., *St. Petersburg, FL; 800-872-4381, 813-528-2477; fax 813-528-2671.*

Circle 404 on reader service card

■ Accounting

Sybiz Vision: Customizable Midrange Accounting

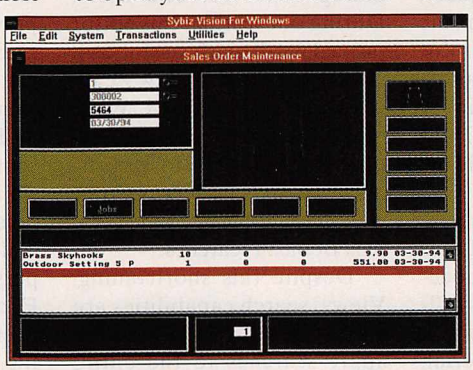
BY KATHY YAKAL

Sybiz International, publishers of the powerhouse entry-level Service Industry accounting program, have entered the midrange accounting market with a multimodule, workgroup-capable package: Sybiz Vision. Vision's overall capabilities are roughly comparable to those found in other accounting products currently available (including Intuit's QuickBooks and Manzanita's BusinessWorks), though Vision currently lacks the ability to do payroll and job costing. The $1,895 program does, however, have extensive customization capabilities—a definite plus.

Based on the FoxPro database engine, Vision is a flexible accounting system that can be customized to fit just about any business without modifying the program's source code. Like the Service Industry Accounting program, Vision's Windows interface lacks elegance, and hampers easy operation by its use of nonstandard navigational aids and terminology.

Vision's modules—which can be purchased individually for $395 to $995 per module—include general ledger, accounts receivable, accounts payable, order entry, inventory management, and purchase order. Sybiz is currently working on payroll and telemarketing/contact manager modules, as well as one for job costing, all of which should be available sometime early this year. Vision includes the powerful Crystal Report Generator, a data dictionary for adding fields and indexes, and a forms editor that we found allows for precise document editing. While Vision does not support OLE functions, it can operate as a DDE server to link documents.

Though Sybiz will make source code available to interested parties, most users are not likely to rewrite portions of the program. Using a product like Visual Basic, you can write a front end that automatically pops open a new screen—or initiates a process—every time a designated screen has been processed. For example, if your company requires fields for multiple levels of information on one inventory item—and setting up dozens of individual inventory item numbers would be too unwieldy—you could add an additional screen for further details. Or you could set a trigger to open your communications application after you've completed documents that are regularly transmitted electronically.



MUDDY WINDOWS: *Sybiz Vision's displays don't use standard Windows terminology, as some of its competitors do.*

We found that the reporting function—a critical function of accounting programs—could be stronger; customization for predefined reports could be easier. Vision's crop of standard reports is comparable to those of its competitors.

QUIRKY INTERFACE

Vision's interface is quirky and not as centralized as it might be. It uses standard pull-down menus and pick lists, but its terminology and general layout varies from the Windows norm; several times we were left wondering what the next step might be. For example, there's no Report menu or icon; you select Print to pull up a list of specific reports. Displays often use no more than two-thirds of the available screen area at one time, and are not as sleek as those found in today's best Windows-based packages. Screen redraws can be slow in some sections of Vision, and we experienced a few system errors, one of which popped us out of the program.

If your company has a capable programmer on its staff (or you are able to hire one) and your business requires the intricate customization options made possible by Vision's unique interleaving technology, Sybiz's new entry into the midrange accounting field may be a good option for you. Its report and forms designers and data dictionary are additional assets that don't require a programmer's skills.

If, on the other hand, your needs for modification aren't as great and you'd prefer a sleeker, more easily navigated interface with better integration and more thorough core functions, a program like Manzanita's BusinessWorks would be a better choice.

▶ **Sybiz Vision, Release 1.5.** List price: *$395 to $995 per module, or $1,895 for Sybiz Starter Kit (includes modules for general ledger, accounts payable, accounts receivable, order entry, inventory, purchase order, and single-user system manager).* Requires: *8MB RAM, 18MB hard disk space, Microsoft Windows 3.1 or later.* Sybiz International Inc., *Fremont, CA; 510-249-1777; fax, 510-249-1776.*

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■ Electronic Publishing

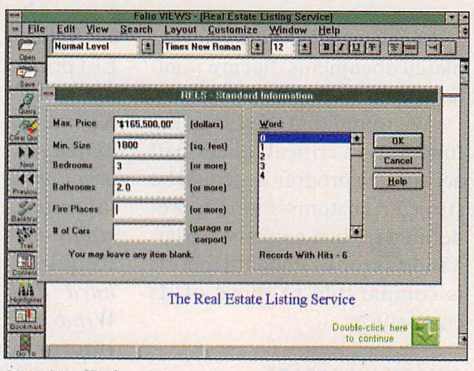
Folio Views: The Digital Publication Toolkit

BY DAVID HASKIN

Folio Views is a robust and refined set of tools for creating text-based electronic books such as on-line policy and technical manuals. While Folio Views has always been simple for information end-users, this upgrade is aimed at making electronic books quicker, easier, and cheaper to create and distribute than paper books.

Folio Views is not a single entity but a group of programs: The $895 Folio Views Infobase Production Kit 3.1 (IPK), reviewed here, is for corporate developers; the $295 Infobase Manager is a subset of the IPK that enables end users to query, read, and annotate electronic books. Folio also sells a kit for commercial developers and a software developer's kit. A toolkit for incorporating SGML-based information should be available early this year.

As with other electronic publishing programs (such as Lotus SmarText), electronic documents—which Folio Views calls infobases—are created by first collecting the textual material. You do that either by importing files directly into the infobase or by using the included infobase creation utility, which indexes and compresses imported text. You also can enter information with Views' built-in word processor. Unfortunately, the package has neither built-in optical character recognition (OCR) nor links to external OCR packages, which would speed the process of converting paper documents into infobases.

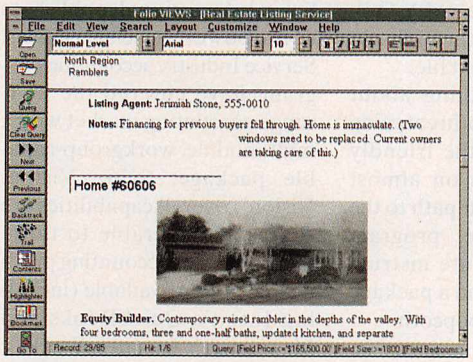


SEARCH: *Folio Views' custom query template development tool lets you create customized searches for information.*

After the text is in place, you add objects like images, tables, and charts, and then create the necessary hyperlinks to connect the various elements into an integrated whole. Folio Views supports several types of links, such as connections that jump from one place in the text to another, as well as those that launch external programs. While creating links is a simple, menu-driven operation, there is no automation for link creation such as that found in Lotus SmarText.

New in this upgrade is a query template editor, which lets developers create custom query dialog boxes for end users. During our testing, this editor proved particularly useful, as it shores up one of the few weaknesses in Views' interface. While most of the interface is self-evident, the dialog box for preparing text searches offers users few clues about how to create complex Boolean searches.

Despite this shortcoming, Views' search capabilities are quite powerful. Not only can you apply searches to the entire infobase or to specific elements such as annotations, you can designate text strings to serve as field names and then query for information within the fields. Folio Views, however, doesn't have the report generation prowess of askSam for Windows, a text-management program that can be used for electronic publishing.



NAVIGATE: *Folio Views provides a clean interface and button-driven aids for moving within the program.*

Besides its robust search capabilities, Folio Views is also notable for the extent to which end users can personalize infobases. Each user can create an overlay of the infobase file. This lets users create personal bookmarks and notes without changing the underlying information. The most significant enhancement to the program is that it now allows several different personal shadow files to be merged. This enables almost instantaneous updating of time-sensitive electronic documents. It also means that people using a Folio Views-based procedures manual for technical support can keep notes that could later be incorporated into the full infobase. The ability to merge these comments also means that Folio Views can function as a group authoring tool that integrates individual revisions or comments into a final document.

One area that stood out as needing further development is Folio View's distribution method to end users. Corporate publishers must purchase the $295 Infobase Manager for each user; this add-in enables end users to query, read, and annotate infobases. Depending on their assigned rights, these users can also edit the underlying information. While these capabilities are far more powerful than the read-only distribution programs used by other electronic publishing packages, Infobase Manager is also much more expensive. Folio claims that the added power justifies the added cost. A royalty-based runtime reader (typically used by commercial information vendors) is also available.

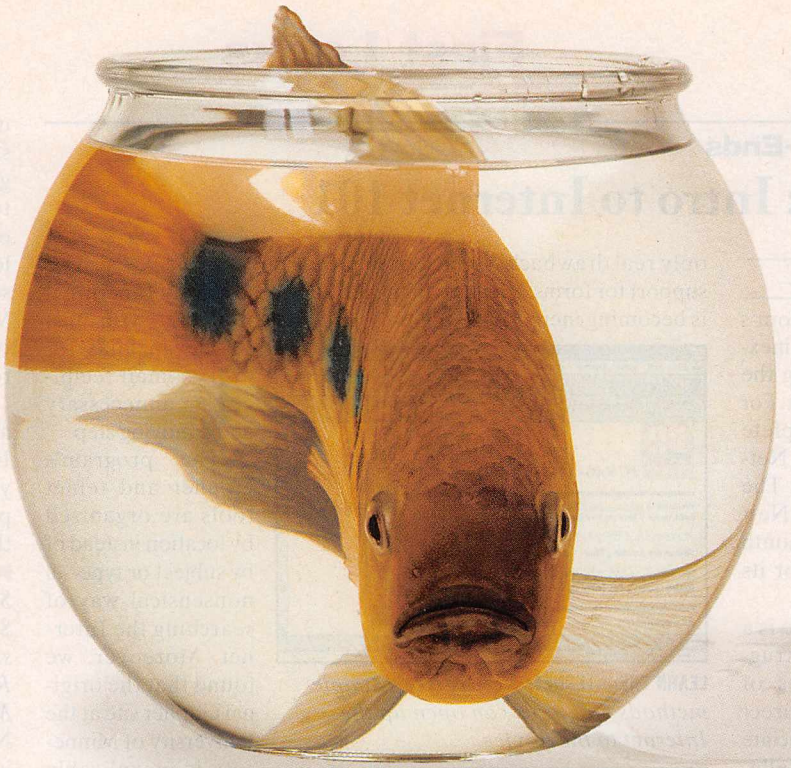
While products like Lotus SmarText make it easier for mainstream users to create electronic documents, they can't match Folio Views' more advanced capabilities. These features add complexity and cost, but they should appeal to developers seeking an efficient and flexible way to manage and deliver large quantities of time-sensitive textual information.

FIRST LOOKS PLUS

From December 19 through 23, you can go on-line to download sample versions of Folio Views and to discuss the product with reviewer David Haskin and Bill Bennett, vice president of marketing at Folio. Type GO EXEC at any CompuServe ! prompt.

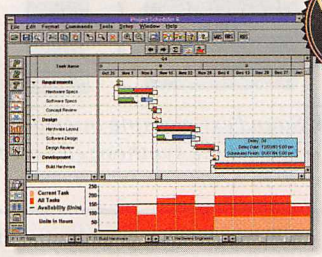
► **Folio Views Infobase Production Kit 3.1.** List price: *$895; upgrade, $95.* Requires: *2MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later.* Folio Corp., *Provo, UT; 800-543-6546, 801-344-3700; fax, 801-229-6790.*

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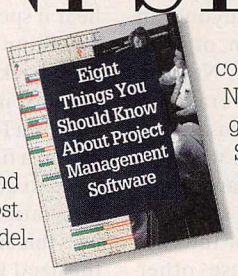
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Internet Front-Ends

NetCruiser: Intro to Internet 101

BY KEVIN REICHARD

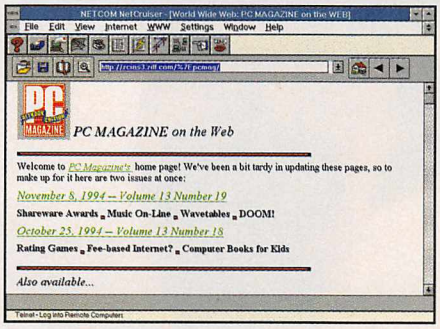
For the beginner, NetCom's NetCruiser 1.5 serves as an inexpensive tool for sampling the major wares of the Internet. For those demanding complete Internet access, however, NetCruiser comes up short. The software costs $4.95, and NetCom charges $19.95 per month plus a $25 start-up fee for its Internet Access service.

Setting up the package is a breeze; anyone who has struggled with the intricacies of Trumpet Winsock or a direct SLIP connection will appreciate NetCruiser's painless installation. You enter a user name and password, and NetCruiser does the rest, dialing an 800 number to determine the closest local access node.

Yet there's a price for this freedom: You're limited to NetCruiser's 30 user nodes, so if you don't live in a large city, the low cost of using NetCruiser is negated by the need to make long-distance calls for Internet access. For example, the closest access point for anyone in Milwaukee, Madison, or Minneapolis is Chicago. Netcom promises more coverage in future NetCruiser releases.

Other limitations will also annoy Internet veterans. Since you're not using a standard Windows Winsock for Internet access, you can't use other Internet utilities (such as PC-Eudora, Mosaic, or Cello) as alternatives to the less sophisticated NetCruiser tools. Only the package's World-Wide Web (WWW) browser is equal to the better commercial or freeware Internet offerings.

The centerpiece of NetCruiser, the browser comes preconfigured with some interesting Web locations, so it's a great tool for a beginner nosing around the Web. Adding your own bookmarks is a simple process; the only real drawback is a lack of support for forms, a feature that is becoming increasingly popular on the Web. Other NetCruiser tools are more limited. Particularly disappointing was the e-mail component, which we found to be barely functional and difficult to use—you must set up an alias for every e-mail recipient, an unnecessary and annoying step.



LEARN THE INTERNET: *NetCruiser's simple methods and tools can open up the Internet to the novice.*

The program's Gopher and telnet tools are organized by location instead of by subject or type—a nonsensical way of searching the Internet. Moreover, we found that the original Gopher site at the University of Minnesota is inexplicably missing from the master list of Gopher sites, while a site at the University of Montana is listed under Minnesota. In addition, stated support for archie is disingenuous: You're merely pointed to an overworked archie server on the Web, instead of running a local archie client. And this version lacks support for WAIS and Veronica, although those features are promised in future revisions.

If you're looking for a cheap and painless introduction to the Internet, NetCruiser will serve your needs. But don't be surprised if you quickly outgrow this package.

▶ **NetCruiser 1.5.** List price: *$4.95; NetCom Internet Access, $19.95 per month plus a $25 start-up fee.* Requires: *4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later.* NetCom On-Line Communication Services Inc., *San Jose, CA; 408-983-1510; fax, 408-983-1537.*

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Windows Utilities

SounText Gives Your PC a Voice

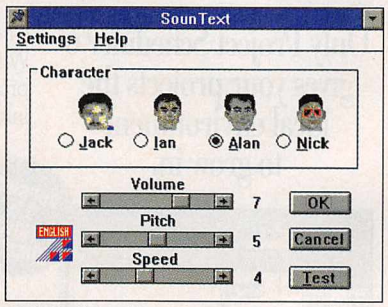
BY DAVID HASKIN

After a long day of staring at a monitor, sometimes the best way to proofread your work is to hear it spoken back to you. The $99 SounText hardware/software package is a handy way to turn text into spoken words.

SounText takes each word within a file and applies a set of rules to determine proper pronunciation. The program then uses this analysis to create a synthesized voice. In a variety of applications, SounText provided the correct pronunciation most of the time and even added a bit of inflection to its reading. The problem is that the four available voices (named Alan, Ian, Jack, and Nick) sound unnatural, and listening to long passages gets tiresome.

Installation of SounText takes a few minutes: Connect the translation hardware to the PC's parallel port and plug the included power cord and speaker into the device (the connector contains a pass-through device, so you can use your printer or other parallel port device). Unfortunately, the hardware module is so large that it blocked our system's serial port.

The SounText software supports text-to-voice for English and seven other languages; to translate to Spanish requires a $30 software driver. There are slider-bar adjustments for volume, pitch, and speed. After loading and minimizing SounText, simply highlight text in any of the 20 Windows applications SounText supports; click on the SounText icon and the program reads the text. In a dialog box, you can fine-tune the pronunciation of words by adding a hyphen before the syllable that needs emphasis.



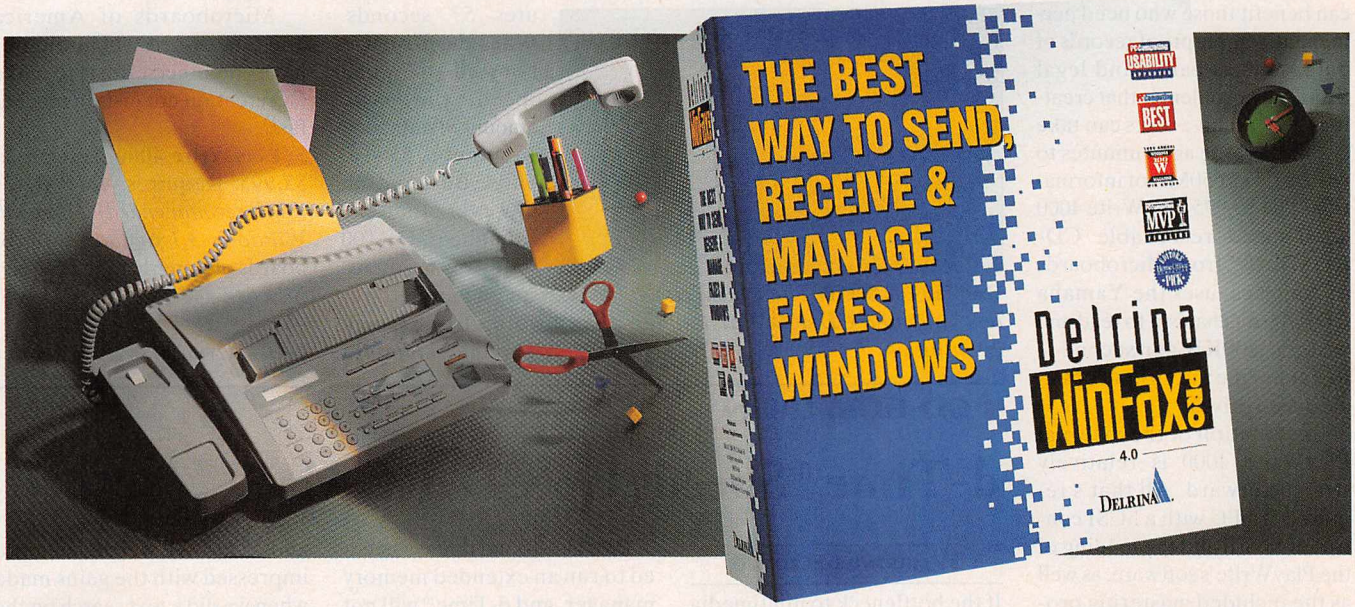
LISTEN: *SounText's simple interface lets you select the synthesized voice you want to hear.*

Because SounText can also speak your words as you type them, it is great for catching typos. SounText could eventually become more useful if it could read your e-mail or announce appointments as they appear in a personal information manager, capabilities Fortress says will soon be available. For most of us, SounText isn't an essential utility, but it has the potential of being a useful one.

▶ **SounText.** List price: *$99.* Requires: *256KB RAM, 5MB hard disk space, Microsoft Windows 3.1.* Fortress Systems Inc., *San Jose, CA; 408-955-9888; fax, 408-955-9895.*

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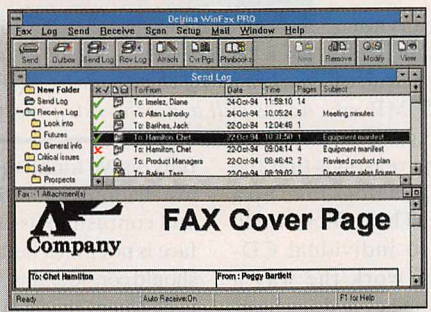
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*Requires Class 1 modem.

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CD-ROM Drives

PlayWrite 4000 CD-R: Do-It-Yourself CDs

BY MICHAEL J. ZULICH

Recordable CD-ROM drives can benefit those who need permanent, tamperproof records of data, such as banks and legal firms. The problem is that creating these archive disks can take a while: as long as 70 minutes to write a CD's 650MB of information. The $5,995 PlayWrite 4000 quad-speed recordable CD-ROM drive, from Microboards of America, uses the Yamaha CDR100 mechanism to read and write at 600KB per second—four times the throughput of single-speed drives.

Installation of the external PlayWrite 4000 is relatively straightforward. All that's required is a PC with a SCSI controller board and the loading of the PlayWrite's software, as well as the included mastering program, CD Record, Version 2.12 for Windows, from Dataware. We found that the PlayWrite drive must be powered up and attached to the SCSI host before installing the software, or all of the needed drivers may not install automatically.

The CD-Record mastering software offers compliance with a variety of CD recording standards, and filling the CD is as easy as dragging and dropping the files or directories you want to include. You can rename both files and directories at this time and add extensions for Macintosh and Unix systems. Once you have selected the files and directories for your CD, an image file is automatically built and optimized. You may then preview the CD-ROM.

Writing the image file to the CD-ROM may be the easiest part of the process. Just select Record and choose the write method you want to use: fastest, safest, or automatic and single or multisession. Evaluation of the PlayWrite 4000 was done with a 486DX2/66 EISA/VL-Bus Micron PC with 8MB of RAM, a 256K external processor cache, and a Seagate 512MB SCSI-2 hard disk. We found that at double speed, the PlayWrite wrote a 433MB disk in 29 minutes 57 seconds. When the drive was boosted to quad speed, the same amount of data took 18 minutes 53 seconds. Be mindful, however, that the Yamaha CDR100 requires quad-speed media to record at full speed. Though standard media work, the drive is incapable of differentiating between double- and quadruple-speed media. The program will show a "recording aborted" error message while in quad-speed mode if you've mistakenly loaded the wrong type of disk.



THE NEED FOR SPEED: *The PlayWrite 4000 lets you cut a CD-ROM disk in less than 20 minutes.*

Microboards of America and Dataware Technologies have combined efforts to make CD creation not just simple, but fast.

▶ **PlayWrite 4000.** List price: *$5,995.* Requires: *4MB RAM (8MB recommended), Microsoft Windows 3.1 or later.* Microboards of America Inc., *Carver, MN; 612-448-9800; fax, 612-448-9806.*

Circle 427 on reader service card

CD-ROM Utility

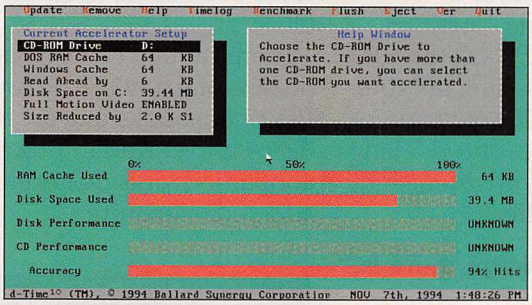
d-Time[10] Speeds Up CD-ROMs

BY MARINO DELZOTTO

If the bottleneck to multimedia performance on your PC is your CD-ROM drive, Ballard Synergy's CD-ROM accelerator, d-Time[10], Version 1.1, may be what you need. The $69.95 d-Time[10] system gives a CD-ROM drive near-hard-disk speed by using data accelerator files that Ballard Synergy calls Timelogs.

Though it is not a large program itself, d-Time[10] requires 20MB to 50MB of hard disk space to operate. The reason is that the program's Timelogs take up a lot of space. These files, which are keyed to individual CD-ROM titles, work the way a database's index file does, storing frequently used information in an accelerator file for quick access. Ballard Synergy includes Timelogs for 86 popular CD-ROM disks, many of which were selected by *PC Magazine* in "The Top 100 CD-ROMs" (September 13, 1994).

We also found that we needed to run an extended memory manager, and d-Time[10] will not function with data compression software. A word of warning: Read the documentation carefully, as we found the program's installation routine to be difficult and confusing; its clunky interface is not much better. Still, you should consider this a worthwhile investment that will pay returns in CD-ROM performance.



NOT A PRETTY FACE: *d-Time[10]'s clunky interface makes using the program difficult—but the package is still a worthwhile investment.*

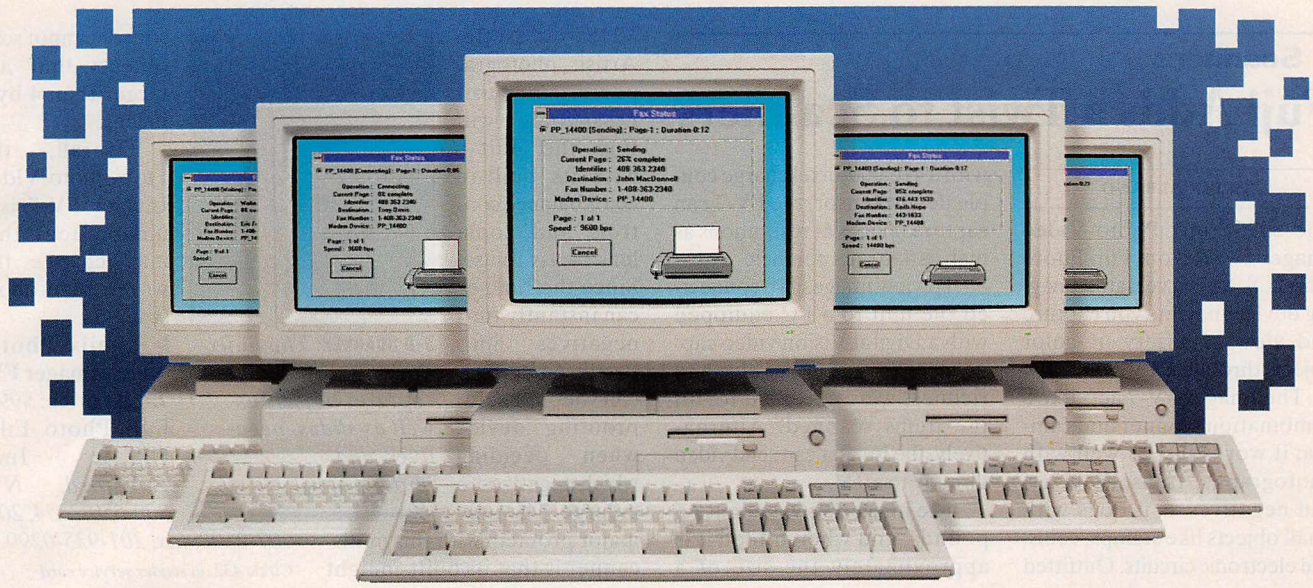
As far as performance goes, we found the use of a Timelog file nothing short of amazing. On several double speed CD-ROM drives we looked at, access time dropped from between 250 and 350 milliseconds to between 15 and 25 ms. We were even more impressed with the gains made when we did a text search on the Microsoft Encarta CD-ROM encyclopedia. The time needed dropped from 9 seconds to a nearly instantaneous response.

In addition, we tested the d-Time[10] without Timelogs using the Microsoft Vidtest benchmark test on a double-speed Mitsumi CRMC-FX0001D CD-ROM drive and compared the results to RAM caching using SmartDrive. While 20 video frames out of a possible 912 were dropped on the SmartDrive test, only 13 frames were dropped using d-Time[10].

If you're interested in increasing the performance of your CD-ROM drive, look no further than d-Time[10].

▶ **d-Time[10], Version 1.1.** List price: *$69.95.* Requires: *2MB RAM, Microsoft Windows 3.*x. Ballard Synergy, *Silverdale, WA; 800-754-1197, 206-656-8070; fax, 206-656-8205.*

Circle 428 on reader service card



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CIRCLE 213 ON READER SERVICE CARD

Scanners

Fuji Adds a Twist to Scanners

BY TIN ALBANO

The $995 Fujix Photo-Video Imager FV-7, from Fuji Photo Film U.S.A., is a versatile imaging device that lets you capture and view a variety of color objects through a TV or PC.

The Imager FV-7 acts like a combination scanner and camera; it works just as well with photographs, transparencies, and negatives as it does with small objects like stamps, coins, and electronic circuits. Outfitted with a 410,000-pixel charge couple device sensor, the FV-7 can capture images at resolutions as high as 450 dots per inch.

To view images, we connected the unit to a PC equipped with a Digital Vision video capture board. Color balance and richness were excellent for all the items scanned. Alternatively, the Imager can send video directly to a TV.

The Imager weighs about 1.5 pounds, and when folded it is approximately the size of a VHS cassette. Artists, photographers, and businesspeople will find the unit—with its built-in color balance controls and zoom lens—easy to use. Since the Imager can instantly turn negatives into positive images, it can be a useful proofing device when deciding which negatives to enlarge. The only major problem with this minis-canner is that its built-in light source cannot scan objects that are larger than 4 by 5 inches.



3-D SCANNER: *The Fujix Photo-Video Imager captures objects as well as slides, negatives, and photographs.*

Overall, the Fujix Photo-Video Imager FV-7 is a unique tool that may change the way we think about scanners.

▶ **Fujix Photo-Video Imager FV-7.** List price: *$995.* Fuji Photo Film U.S.A. Inc., *Elmsford, NY; 800-659-3854, 201-507-2500; fax, 201-935-0299.*

Circle 432 on reader service card

Scientific Software

Prism: Shortcut to Data Analysis

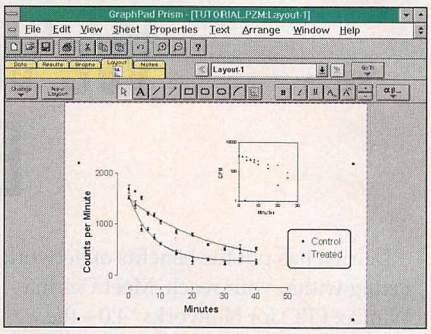
BY BARRY SIMON

Prism, Version 1.03, GraphPad Software's $495 scientific graphing program, assumes that scientists want to analyze and graph different data sets in similar ways.

Prism uses data templates, so once you've completed an analysis, all you have to do is enter the new data to get new results.

The program's greatest weakness is its limited variety of graph types. Prism can produce only line, bar, column-scatter, and box/whisker plots. And while it is easy to add subscripts or superscripts, you can't have both at the same time. Prism doesn't support OLE as a server or client, but you can export graphs as .WMF files or in the standard bitmap formats.

Prism has a smooth technical graphing interface. Each graph's legend, titles, and axes are object oriented, so they can be edited by simply double-clicking on them. Prism is an attractive choice for those who periodically perform the same analysis and don't require a variety of graph types.



STACK: *Prism's layout tab lets you use and annotate multiple graphs.*

▶ **Prism, Version 1.03.** List price: *$495; competitive upgrade, $295.* Requires: *4MB RAM, 3MB hard disk space, Windows 3.1 or later.* GraphPad Software, *San Diego, CA; 800-388-4723, 619-457-3909; fax, 619-457-8141.*

Circle 434 on reader service card

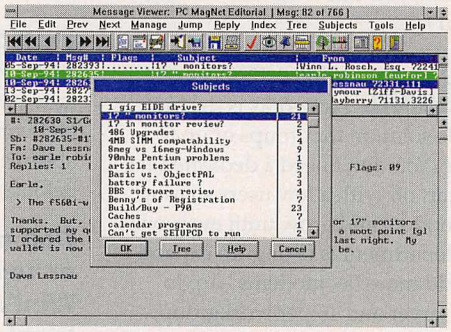
On-Line

OzCIS Brings out the Best in CompuServe

BY EARLE ROBINSON

If keeping track of your CompuServe forums, newsgroups, and e-mail seems like the impossible dream, Ozarks West Software's $69 OzCIS for Windows (OzWin) may be an eye-opener. The first third-party navigator that integrates CompuServe's Host Micro Interface, OzWin simplifies the on-line service.

Available on CompuServe or directly from Ozarks West, OzWin sits on top of WinCIM or CSNav. OzWin's interface is functional rather than glitzy. We found the multiplicity of parameters for mail and forum management daunting at first, but the on-line help module proved thorough and useful in the absence of an adequate manual.



Manage: *OzCIS for Windows lets you easily manage your use of CompuServe.*

Message management features include indexing, purging, and archiving of old mail. Since files are in ASCII format rather than a proprietary one (as in WinCIM and CSNav), you can either use the program's excellent tracking and message management, or move the messages into another program.

OzWin also offers a capable message editor that allows you to view multiple messages at once. A macro language is included to automate on-line access; built-in modules will obtain weather forecasts and stock quotations.

Though we found several minor bugs in this initial version, OzWin is a reliable performer that's a prime choice as a CompuServe navigator.

▶ **OzCIS for Windows, Version 1.1.** List price: *$69.* Requires: *4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later.* Ozarks West Software Inc., *Colorado Springs, CO; fax, 719-548-8557; CompuServe, 74774,417.*

Circle 433 on reader service card



Sound Blaster
Value Edition
SRP, $69.95

The sound decision.

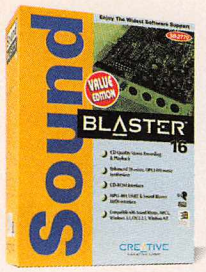
With hundreds of today's hottest games written for Sound Blaster™ cards, there are so many tough decisions. Will it be the thunderous explosions in *Rebel Assault*, or the eerie howling of *The 7th Guest?* The Sound Blaster Value Edition card is an economical way to get started. It's an 8-bit sound board that works with any Creative Labs CD-ROM and includes sound utilities and games.



Sound Blaster Pro
Value Edition
SRP, $105.95

The smart decision.

Games are not the only software designed for Sound Blaster cards. Imagine a math program with a vast array of sound effects. It's mesmerizing. It's hypnotic. Especially if you have the Sound Blaster Pro Value Edition, the 8-bit sound card with stereo sound. It's compatible with Creative Labs CD-ROM drives, and comes with innovative sound utilities and recording software.



Sound Blaster 16
Value Edition
SRP, $139.95

The 16-bit decision.

The Sound Blaster 16 Value Edition is the best-selling sound card ever. It works with any Creative Labs CD-ROM drive and delivers stereo sound that meets MPC2 standards. It works with any speakers or headphones. And after experiencing a 16-bit game on Sound Blaster, you'll bolt to a nearby window, stick your reverberating head outside, and start screaming like a banshee, "I WANT 16-BIT SOUND!"

Tough decision. Choose one Sound Blaster or buy 5 more computers?

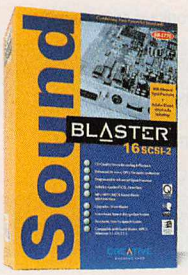


Sound Blaster
16 MultiCD
SRP, $199.95

With Advanced
Signal Processor
SRP, $249.95

The freedom decision.

Sound Blaster 16 MultiCD™ preserves your freedom of choice! It will connect a CD-ROM drive from manufacturers such as Sony, Mitsumi, and of course, Creative Labs. This 16-bit card is upgradeable to Wave Blaster™ II or an Advanced Signal Processor, the advanced technologies for MIDI music and more demanding sound-enhanced programs.

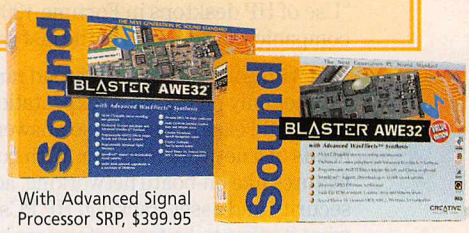


Sound Blaster
16 SCSI-2
SRP, $249.95

With Advanced
Signal Processor
SRP, $299.95

The I-want-it-all decision.

Sound Blaster 16 SCSI-2 delivers everything and compromises nothing. It's 16-bit sound with an optional Advanced Signal Processor and a collection of sound utilities. But best of all, it connects the sound card and up to six SCSI devices to a single port.



Sound Blaster
AWE32
Value Edition
SRP, $329.95

With Advanced Signal
Processor SRP, $399.95

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The next generation of games will arrive with sound so real, you'll have to hang on to your headphones. Only Sound Blaster AWE32 can deliver the ultimate CD-quality sound. Real instrument samples and real sound effects. It's a 16-bit card with Advanced WavEffects™ and an optional Advanced Signal Processor. And other cool stuff. Like QSound, a 180° soundscape of intense virtual audio. Sound Blaster AWE32 has it all.

Sound BLASTER

Of course, all Sound Blaster cards are easy to install and provide 100% compatibility with all software written for the Sound Blaster audio platform. Make your decision and visit your nearest Creative Labs dealer. Or call 1-800-998-5227 Ext. 111

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Advanced Bus Architecture	PCI	VL	
Integrated Networking Interface	32-bit	16-bit	
Integrated, multiprotocol Boot-ROM	X	X	
ISA Plug-n-Play Compliant	X	X	X
Multilevel Security Features	X	X	X
Asset tracking	X	X	X
PC tattooing	X	X	X
Optional Desktop Management Software	X	X	
Bi-directional parallel port	X	X	X
Desktop Management Interface (DMI)[3]	X	X	

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- *210-MB hard drive[1]*
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- *512 KB or 1 MB of Video RAM standard*
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HP Vectra VL2

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- *EPA Energy Star certified*
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- *8-MB RAM, expandable to 96-MB*
- *Ultra VGA2 local-bus accelerated video supporting up to 1280 x 1024 resolution*



HP Vectra N2

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- *Multilevel security*
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- *ISA Autoconfiguration utility (Plug-n-Play)*
- *Integrated Desktop Management Interface (DMI)[3]*
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- *One available 32-bit VL-bus slot*
- *210-MB, 14-ms Fast-IDE hard drive[1]*
- *32-bit Fast-IDE local-bus hard disk interface*
- *8-MB RAM, expandable to 96-MB*



HP Vectra M2

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- *Optional integrated 10Base-T networking*
- *Systems Diagnostics Utility*
- *EPA Energy Star certified*
- *ISA Autoconfiguration utility (Plug-n-Play)*
- *Integrated Desktop Management Interface (DMI)[3]*
- *Free three-year limited warranty for parts and labor[2]*

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- *Four mass storage shelves; four expansion slots*
- *Two available 32-bit PCI expansion slots*
- *210-MB, 14-ms Fast-IDE hard drive[1]*
- *32-bit PCI IDE hard disk interface*



HP Vectra XM2

- *8-MB RAM, expandable to 96-MB*
- *PCI Integrated 64-bit S3 Vision-864 graphics accelerator supporting up to 1280 x 1024 resolution*
- *Optional PCI Integrated 32-bit 10Base-T networking*
- *Integrated Desktop Management Interface (DMI)[3]*
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- *PCI architecture*
- *Four mass storage shelves (three front accessible); five expansion slots*
- *Two available 32-bit PCI expansion slots*
- *270-MB, 12-ms Fast SCSI-2 hard drive[1]*



HP Vectra XU

- *Integrated 32-bit PCI SCSI-2 interface*
- *PCI integrated 64-bit S3 Vision-864 graphics with 1280 x 1024 resolution or PCI MGA Ultima Plus graphics with up to 1600 x 1200 resolution*
- *32-bit PCI IDE hard disk interface*
- *8 or 16 MB of RAM, expandable to 256 MB*
- *PCI Integrated 32-bit 10Base-T networking*
- *Integrated Desktop Management Interface (DMI)[3]*
- *Free three-year limited warranty for parts and labor[2]*

from $3,279†

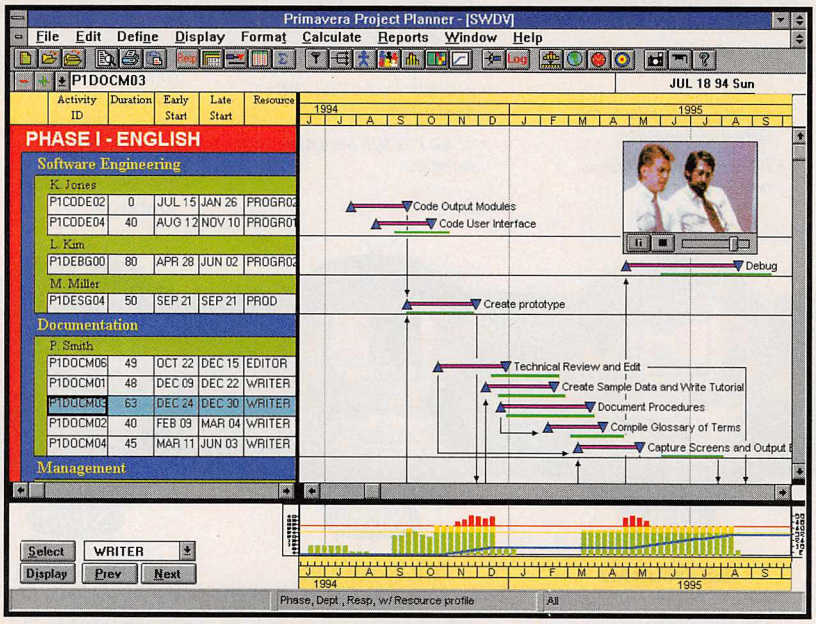
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All HP Vectra PCs come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11 pre-installed; HP mouse and keyboard included. *Feature included with some models. †U.S. list price, dealer prices may vary. Monitor not included. [1]Other capacities available. [2]First year on-site, 24-hour service. Second and third year return to dealer. [3]Available 10/1/94. ‡With permission CRN/Benchmark. MS-DOS is a U.S. registered trademark and Windows is a trademark of Microsoft Corporation. Pentium and the Intel Inside logo are U.S. trademarks of Intel Corporation. PPG407 ©1994 Hewlett-Packard Company

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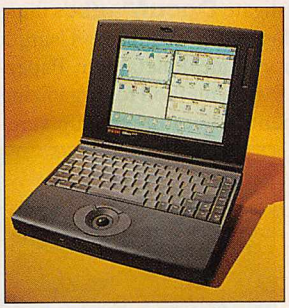
NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

By Asa Somers

NEW

Digital's HiNote Wraps Power Up In a Small Package

The new Digital HiNote series of notebook computers, available in five different configurations ranging in price from $1,699 to $4,399, represents a new direction in portable computing for **Digital Equipment Corp.** Each HiNote features an attractive design, small footprint, thin profile, and light weight: For example, the high-end CT 450 and CT 475—both TFT active-matrix color models—each weigh 5.5 pounds and measure 1.7 inches high. In addition to the TFT color notebooks, Digital also offers two dual-scan STN color models and a monochrome HiNote. All five units measure 8.5 by 11 inches and come with full-size 82-key keyboards and 9.5-inch displays.



Digital's HiNotes come in five different models, from monochome to TFT active color.

Each of the HiNote computers comes with a trackball pointing device centered below the Spacebar with large, circular, customizable actuation buttons for either right- or left-handed users. Additionally, the HiNotes come with up to 1MB of VRAM and 32-bit local-bus video.

Hard disks are user-upgradable and available in 120MB, 240MB, and 340MB configurations, which is adequate for now. Power management capabilities give up to 6 hours of battery life between charges, according to Digital. The HiNote units come bundled with several software packages, and Digital has even included Delphi's InterNav Internet navigation software with each HiNote.

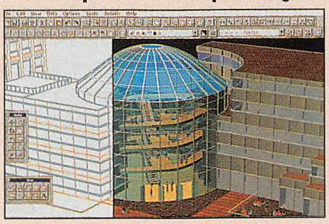
The company is also introducing the higher-end HiNote Ultra series of notebooks; these computers pack even more power and features in even smaller packages.

▶ **Digital HiNote series.** List price: *$1,699 to $4,399.* Digital Equipment Corp., *Acton, MA; 800-722-9332; fax, 800-524-5694.*

Circle 408 on reader service card

HOT PROSPECT

AutoCAD 13 Adds Features and Multiplatform Compatibility



Autodesk is now shipping the new version of its industry-leading AutoCAD software. Now, in Release 13, AutoCAD adds a slew of features and comes with a multiplatform license initially for DOS and Microsoft Windows only and, in the first quarter of this year, for Windows NT.

In addition to multiplatform support, Autodesk has added OLE client and server support. Release 13 can read drawings made in earlier versions of the product, and it has a Save As function for downward compatibility.

Release 13 adds a number of high-end features, including ACIS-based solid-modeling capabilities, which give you solid primitives, free-formed curves, and Boolean operations for creating 3-D models of your designs. Dimensioning and hatching capabilities have been expanded, and Autodesk has added complex line-type functions and a spell-checker for text entries.

Release 13 also features a new interface designed to capitalize on Windows functionality. On-line interactive tutorials and context-sensitive help are included as well. New thumbnail images help you identify a drawing before loading it, which can save time when working with large files.

▶ **AutoCAD, Release 13.** List price: *$3,750; upgrade from Release 12, $495; upgrade from Release 11 or earlier, $695.* Autodesk Inc., *Sausalito, CA; 800-964-6432, 415-332-2344; fax, 415-331-8093.*

Circle 407 on reader service card

NEW

Overnight Mail Right from the Desktop

Federal Express has announced an on-line service—scheduled to debut in the first quarter of this year—that will allow small-office/home-office operators to schedule and follow up on Federal Express deliveries from their desktop PCs. All you need is a modem and a laser printer, and FedEx Ship provides pick-up request service, verification of shipment accuracy, and shipment tracking—all on-line.

You connect to FedEx Ship's servers in Memphis, Tennessee, via a local or toll-free call. The client software installs on Windows or Macintosh workstations and provides a graphical interface that outlines available services. You print FedEx shipping labels on your local printer without the need for special forms. Federal Express has also signed agreements to create FedEx Ship areas on America Online and Commercenet.

▶ **FedEx Ship.** List price: *Free.* Federal Express, *Memphis, TN; 800-463-3339.*

Circle 410 on reader service card

NEW

Logicode's Datasafe Modem Provides Security at 28.8 Kbps

Logicode Technology's new V.fast-class 28.8-Kbps Datasafe modem combines password protection, call-back security, and remote configuration in a hardware-based solution that comes in both PC- and Macintosh-based models. The Datasafe supports most standard transmission protocols, including V.25bis (international), and has an auto-fallback and auto-fall-forward function that insures you are sending data at the highest possible speed.



The Datasafe uses password protection and call-back security to safeguard data.

Logicode offers an upgrade to V.34 for $19 and bundles Delrina 4-in-1 data and fax transmission software

Photography by Thom O'Connor

with the unit. The Datasafe has software volume control and runs self-diagnostics every time you turn it on.

▶ **Datasafe.** List price: *$319.* Logicode Technology Inc., *Camarillo, CA; 800-735-6442, 805-388-9000; fax, 805-388-8991.*

Circle 409 on reader service card

NEW

capaCD PRO Squeezes More Data Onto CD-ROMs

EWB has announced a new data-compression product that is designed to help small publishers of CD-ROM–based software maximize the space on each CD-ROM disk they produce. Using the company's proprietary Multipress compresion engine and AutoSnoop utility, capaCD PRO recognizes different kinds of data and determines the most appropriate compression technique for each. EWB claims that this technique allows publishers to fit from two to ten times as much information on a single CD-ROM. The capaCD PRO program is compatible with standard CD-ROM drives and therefore does not require end users to purchase additional hardware or software to play a disk that uses EWB's compression technology. CD-ROM data-transfer speeds should also benefit somewhat, since capaCD PRO reduces the amount of data being transferred prior to decompression.

▶ **capaCD PRO.** List price: *$2,995.* EWB, *Carlsbad, CA; 619-930-0440; fax, 619-930-0446.*

Circle 413 on reader service card

IMPROVED

BAT Seven-Key Keyboard Now Stores Macros

Nonconventional keyboards can be the only option for users with certain disabilities. **Infogrip**'s BAT (Biomechanical-Automated Technology) Keyboard has only seven keys, which provide all the capabilities of a conventional keyboard when used in various combinations. The device is designed so that it can be used with only one hand, and typing speeds typically reach 25 to 45 words per minute. The BAT Keyboard lets you create WordChord macros that reduce complex command sets to one or two keystrokes with its ChordEasy software. For example, you can create a WordChord for "Massachusetts" that requires you only to type "MA." A new battery-backup version of the product stores macros so you don't have to reinstall software if you unplug the keyboard and move it between PCs. You can use the BAT Keyboard alone, in pairs, with a conventional keyboard, or with a mouse or tablet.



WORDCHORDS: Type "MA" for "Massachusetts."

▶ **BAT Keyboard.** List price: *$199.* Infogrip Inc., *Northbrook, IL; 800-397-0921, 805-652-0770; fax, 805-652-0880.*

Circle 412 on reader service card

BRIEFS

Software

SofTouch Systems has updated its GammaTech Utilities for OS/2, now in Version 3.0. The latest version is designed to be a companion tool for the much-hyped OS/2 Warp, and features over 200 enhancements, including improvements in power and performance. The new DiskMap utility displays FAT or HPFS volumes to identify bad sectors, while the HexDump feature lets you convert binary files into ASCII for editing with any standard text editor. File-maintenance commands have been updated, and a new UnDelete utility has been added. 405-947-8080; fax, 405-632-6537.

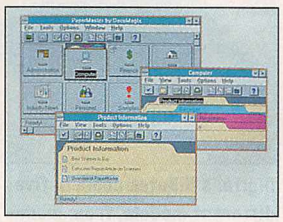
Kansmen Corp. has announced its new product, Do-Over, which allows you to change the look and feel of almost every aspect of your Microsoft Windows 3.*x* desktop. The package includes a number of sample Windows looks and provides methods for you to create your own. There is a design that resembles the look of Windows 95 and one that feels like X Window. The Do-Bar utility adds one-touch access to all applications currently running on the desktop. It is fully customizable, displays the time and date, and has a Run button that calls up program groups and launches apps with a click of the mouse button. 408-263-9881; fax, 408-263-9883.

MindWorks Corp. has introduced a new document image-management system for the desktop PC called The Knowledge Builder. It is a software/hardware bundle that includes the company's Recollect management software, a monochrome scanner, a MindBank 270 magnetic storage device with one 270MB cartridge, and a SCSI interface kit—all for a reasonable list price of $2,995. Recollect uses OCR to identify meaningful words and phrases in every document you scan in, creating a separate index for each one that travels with the document. You can type in any string of words from the document and Recollect's retrieval engine will find it for you, marking the selected string with a bull's-eye symbol. 800-396-6463, 408-730-2100; fax, 408-730-2143.

NEW

The Paper Chase Ends with PaperMaster

For an electronic alternative to storing your paper documents in conventional file cabinets, you'll want to investigate **DocuMagix**'s filing software, PaperMaster for Windows. Using a folder-and-drawer graphical metaphor, PaperMaster provides a logical method for organizing scanned-in documents without taking up egregious amounts of office space. The software's Auto-Filing feature recognizes and groups multiple documents of the same kind automatically. For example, once you have scanned in an invoice from your shipping company a few times, the program learns to file the appropriate invoices together.



PaperMaster's metaphor makes your desktop seem like a conventional file cabinet.

You can search on a document by typing in any part of its filename (which can be up to 255 characters in length), a sentence from the document itself, or an annotation applied to it. You can move documents and folders around simply by dragging and dropping file icons with your mouse. Documents scanned into PaperMaster cannot be altered, so signatures and other sensitive information will remain in their original forms—an important security provision. Finally, the program's convenient "sticky note" feature allows you to place multiple annotations anywhere on a page without altering the original document.

▶ **PaperMaster for Windows.** List price: *$169.* DocuMagix Inc., *San Jose, CA; 800-362-8624, 408-434-1138; fax, 408-434-0915.*

Circle 411 on reader service card

CUT THE CORD.

RADIO TECHNOLOGY

FRESH TODAY!

MOUSEMAN® CORDLESS.

LOGITECH

PC Computing MVP '95 WINNER ™

TREAT YOURSELF TO SOME DESKTOP FREEDOM WITH MOUSEMAN CORDLESS.

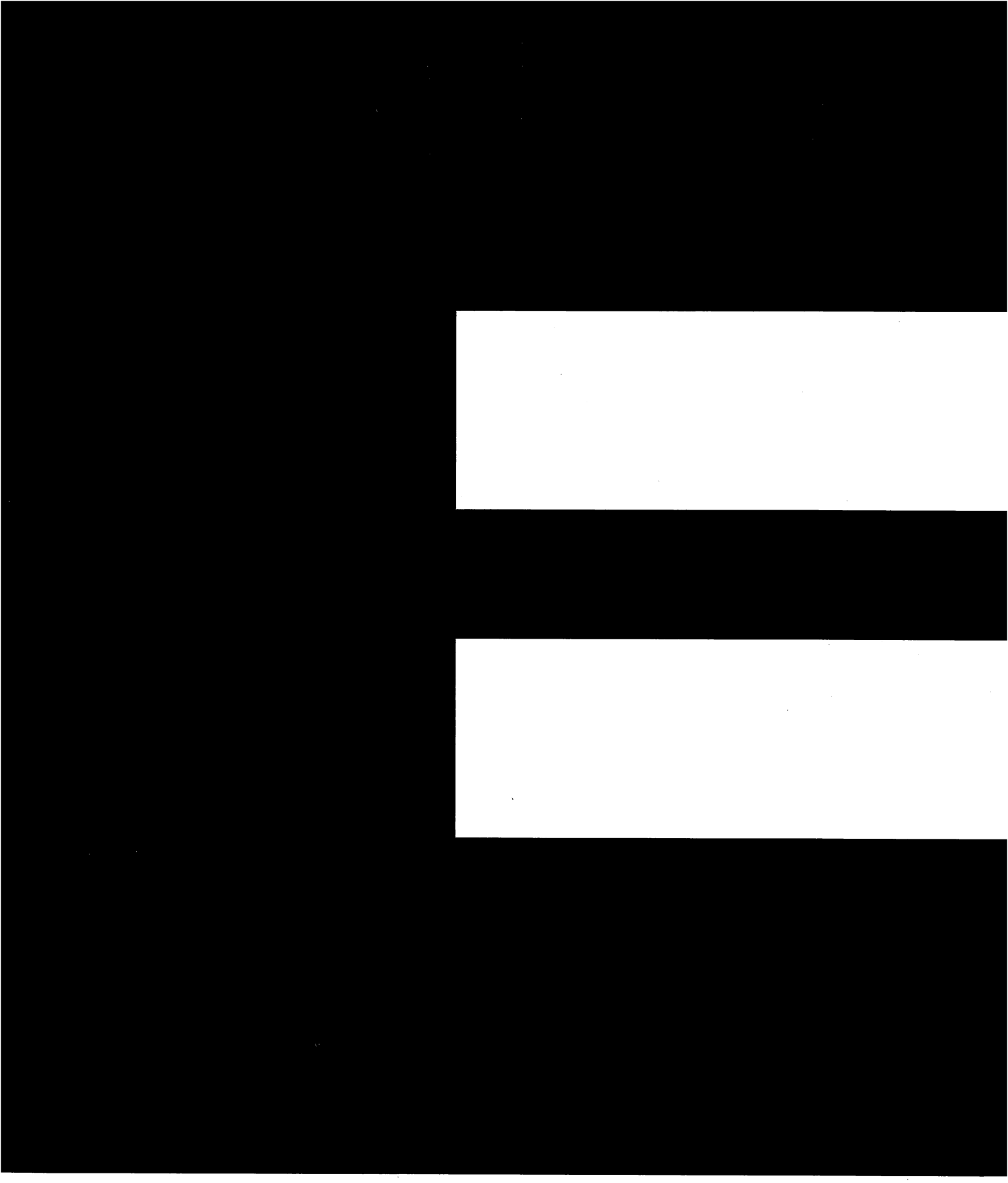
- **SUPERIOR RADIO TECHNOLOGY WORKS RIGHT THROUGH DESKTOP CLUTTER.**
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- **NO MORE DOUBLE CLICKING! ASSIGN ALL DOUBLE CLICKS TO A SINGLE CLICK.**
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- **PLUG AND PLAY READY.**
- **THREE YEAR WARRANTY.**
- **TO RECEIVE PRODUCT INFORMATION BY FAX, CALL 1-800-245-0000, EXT. 4014.**

Radio receiver tucks away anywhere on the desktop.



LOGITECH

CIRCLE 182 ON READER SERVICE CARD



The Canon® BJC®-4000. Its resolution is equal to laser quality. Its print speed is 5ppm. It's less than $400.

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Plus there's brilliant color. The math couldn't be simpler.

Canon



BJC-4000
color printer.

D E A L E R C A L L 8 0 0 - 8 4 8 - 4 1 2 3 .

*CCSI, 2995 Redhill Ave., Costa Mesa, CA 92626. In Canada, call (800) 263-1121. * Dealer Prices May Vary.*

IMPROVED

Mark Up Your Presentations on Television

Consumer Technology has announced enhanced versions of its Presenter 3 series of computer-to-TV scanning adapters. The Presenter 3 series includes the Presenter 3, Presenter Sound (which can also send .WAV files to a television), and Presenter 3 Mac/PC (which will work with either a PC or a Macintosh). Because televisions and computer displays redraw screens differently, converting images created on a computer to a TV screen often results in headache-inducing flicker. The Presenter 3 series includes new Video Stabilizer line-averaging technology and Sharp View circuitry, which virtually eliminate screen flicker. You may notice a slight sacrifice of color richness from the conversion, however. Included with all three Presenter units are the new Electronic Marker and Electronic Marker Pad presentation tools, which allow you to draw and annotate your presentations on-screen in real time, just as you would a transparency.

▶ **Presenter 3 series.** List price: *Presenter 3, $349; Presenter Sound, $395; Presenter 3 Mac/PC, $429.* Consumer Technology, *Beaverton, OR; 503-643-1662; fax, 503-671-9066.*

Circle 415 on reader service card

NEW

Power Tools: Lotus's Value Pack Enhances SmartSuite for OS/2

Lotus Development Corp. has introduced a collection of productivity tools designed to improve the integration between Lotus SmartSuite and the OS/2 Workplace Shell. The Value Pack for OS/2 includes five key components: SmartCenter, an object-based icon bar for managing the entire OS/2 desktop; Ami Pro Bonus Pack macros, which facilitate efficient operations among Ami Pro, Lotus 1-2-3, and Freelance Graphics; the 1-2-3 File Translator; new Freelance SmartMaster presentation styles and business symbols; and REXXLink for 1-2-3 for creating custom macros. The Value Pack is now available to licensed SmartSuite for OS/2 users and will begin shipping as part of SmartSuite soon after you read this.

▶ **The Value Pack for OS/2.** List price: *$10 (for registered SmartSuite users).* Lotus Development Corp., *Cambridge, MA; 800-872-3387 ext. 9779, 617-577-8500; fax, 800-343-5414.*

Circle 417 on reader service card

BRIEFS

Software

Usemco Technologies is now shipping its Mobile Trader hardware/software product, which allows you to execute and confirm stock orders from any desktop, laptop, or pen-based personal computer via a wireless data communications service from RAM Mobile Data. Mobile Trader includes a wireless modem, runs under Microsoft Windows, and costs $295 per month, with no additional connection fees. The service also includes e-mail, fax, and paging capabilities. 212-432-7000.

KTools, from **Bramblebush Software,** is a new add-on for use with Microsoft Word for Windows 6.0 that adds four important functions for preparing legal contracts. The $99 KTools includes a function that takes you directly to any provision or definition in your document; the X-Ref Checker, which verifies every cross-reference; a function to check all your provisions and clause numbers; and the ToC Coder, which generates a table of contents, even if you don't use heading styles. 203-966-0198; fax, 203-966-2397.

For creating complicated 3-D images and animations without mastering a behemoth like Autodesk 3D Studio, beginners can cut their teeth on Asymetrix 3D F/X. **Asymetrix Corp.**'s new $295 program contains sophisticated features—including real-time, solid-model preview (which lets you see scenes as realistic solid shapes rather than wireframes as you work)—designed to provide powerful 3-D creation features and ease of use. The Visual Browser provides more than 300 3-D models, shapes, and starter scenes. 3D F/X supports 24-bit color, alpha-channel operations, and text warping. 800-448-6543, 206-462-0501; fax, 206-637-1504.

Hardware

3M Optical Systems has begun shipping its PF50 notebook privacy filter, which uses microlouver technology to make on-screen data visible only to someone sitting directly in front of the display. The $119 filter measures less than 0.5 inches in thickness and weighs less than a pound; it also reduces glare.

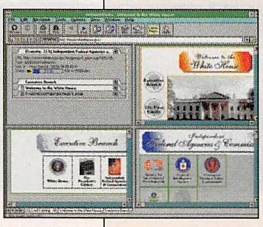
NEW

InternetWorks Provides Multithreaded Access

BookLink Technologies has begun shipping InternetWorks, an Internet browser that includes multithreaded on-line access. The package features a single, integrated graphical interface and full OLE 2.0 support. It also includes all major Internet communications software, such as TCP/IP, Winsock, and SLIP/ PPP. Full support for e-mail, FTP, Gopher, Network News, and WAIS is also provided. While you are in the process of downloading information, InternetWorks' multithreading capabilities allow you to perform other functions at the same time, such as reading documents previously downloaded to your PC, sending and receiving e-mail, browsing newsgroups, and starting searches and additional downloads. You can also design custom on-line applications that access the Internet through InternetWorks with any scripting language that supports OLE 2.0. The program also comes with an electronic version of the *New Rider's Internet Yellow Pages,* a directory of Internet sites.

NEW & IMPROVED PLUS

You can download



InterNetworks Lite, a streamlined version of InterNetworks, from Library 4 of the Editorial Forum on ZiffNet. Type GO EDITOR from any CompuServe ! prompt.

▶ **InternetWorks.** List price: *Until January 31, $99; thereafter, $129.* BookLink Technologies, *Wilmington, MA; 508-657-7000; fax, 508-657-8824.*

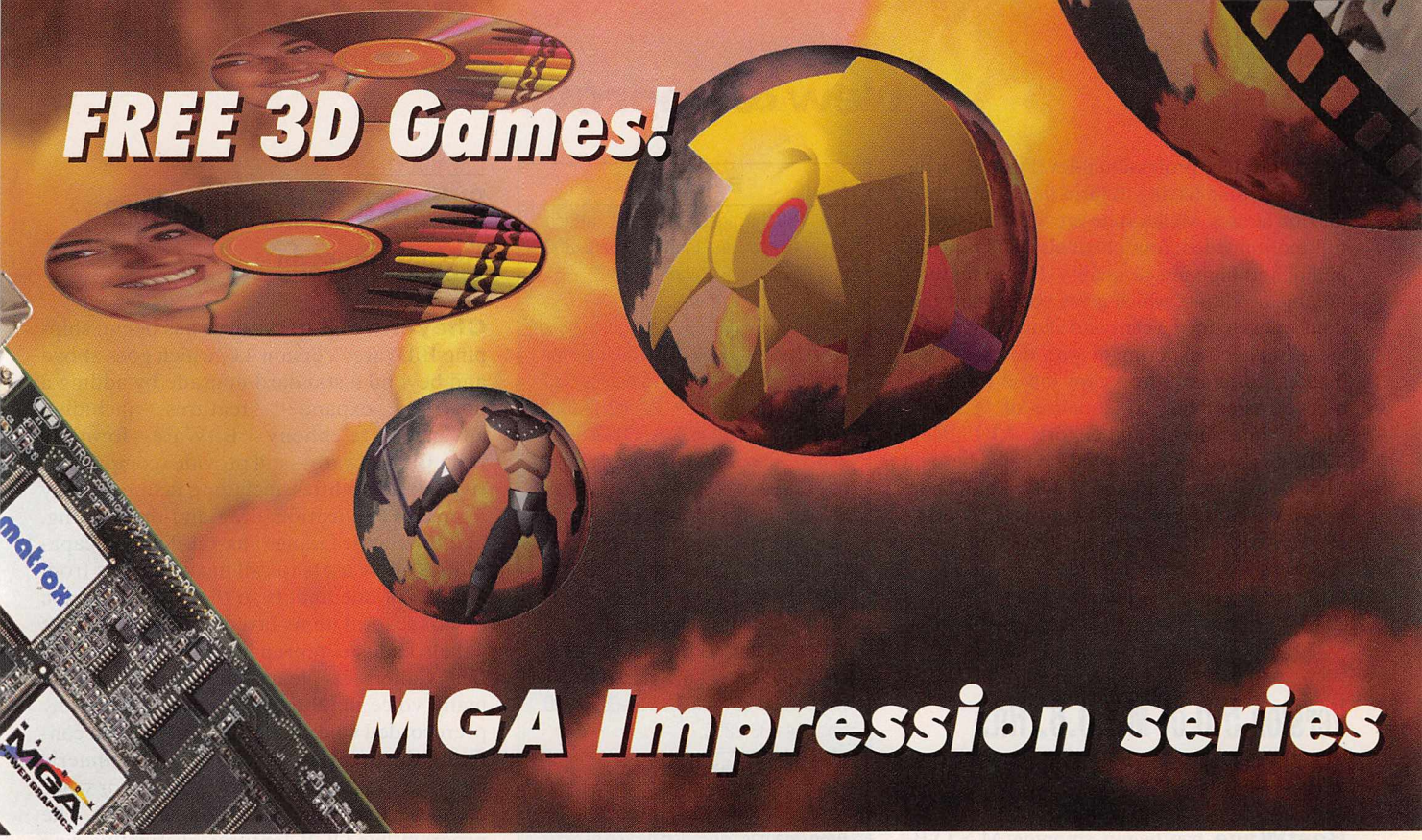
Circle 414 on reader service card

NEW

Making Movies: Avid Moves onto The Windows Platform

Avid Technology will soon begin shipping its nonlinear video-editing software, Media Suite Pro for Windows. This high-level package is an integrated hardware and software video solution based on the Truevision Targa 2000 EISA board, which you must have specially installed in your PC. Avid has optimized the Media Suite software to work with this board. The system is designed to

Photograph by Jeff Krein



Windows, video and 3D acceleration starting at $369!

The new standard in graphics

Don't be fooled by the competition's FALSE speed comparisons. Matrox's MGA series of 64-bit graphics accelerators won ALL five Editors' Choice Awards in PC Magazine's graphics review of June 28, 1994 due to a combination of superior performance and productivity features. MGA Impression Lite and MGA Impression Plus - the newest additions to the MGA family - take graphics performance one step further by adding over 20 productivity features, powerful video playback, 3D acceleration, and FREE state-of-the-art, arcade-quality 3D games. Move into the future with MGA!

New! MGA Impression Lite

- 2 MB VRAM non-upgradable
- 1280 x 1024 in 256 colors
- 800 x 600 in 16.7 M colors
- 120 Hz refresh at 1024 x 768
- DCI software video acceleration
- Hardware accelerated 3D
- MGA PowerDesk and MGA DynaView 2D/3D
- Includes MGA 3D-SuperPack

New! MGA Impression Plus

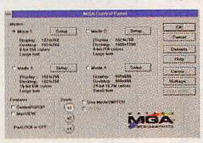
- 2 MB VRAM upgradable to 4 MB
- 1600 x 1200 in 256 and 65K colors
- 1280 x 1024 in 16.7 M colors[1]
- 120 Hz refresh at 1024 x 768
- Upgradable to the VM-Channel and PowerPlay64
- Hardware accelerated 3D
- MGA PowerDesk and MGA DynaView 2D/3D
- Includes MGA 3D-SuperPack

PC Magazine (U.S.) June 28, 1994

MGA Impression ISA	MGA Impression VL-Bus	MGA Ultima Plus VL-Bus	MGA Ultima Plus PCI	MGA Ultima Plus 200 PCI
PC MAGAZINE EDITORS' CHOICE	PC MAGAZINE EDITORS' CHOICE	PC MAGAZINE EDITORS' CHOICE	PC MAGAZINE EDITORS' CHOICE	PC MAGAZINE EDITORS' CHOICE

MGA PowerDesk features for Windows

- Full Windows installation and monitor selection
- Instant ModeSWITCH™ on-the-fly resolution and color depth switching
- Virtual desktop sizes up to 1600 x 1200
- PixelTouch hardware pan & zoom
- QCDP true color dithering
- Center Pop-Up and Center Window
- MaxVIEW
- PanLock
- Quick Access



MGA DynaView™ 2D/3D features for CAD

- Hardware accelerated Gouraud shading, double-buffering[2] and Z-buffering[2]
- Real-time 3D movements and rotations
- Dynamic Spy Glass and Bird's Eye views
- Scroll and Zoom bars
- Resizeable and repositionable main Window
- Scrollable Text Window
- Programmable pop-up Iconic menus and Tool Strip

FREE MGA 3D-SuperPack

- Three interactive, real-time 3D games from 47-TEK™, Velocity™, and Amorphous Designs™
- 3D demos from Criterion™ and RenderMorphics™
- RenderWare 3D software developer's kit from Criterion
- ... and more!

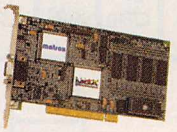


"Matrox has set the bar now for games on a PC."
Jon Peddie Associates, Sept. 20, 1994, p.753

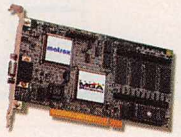
"Matrox Graphics is once again raising the bar in the graphics accelerator game..."
James Karney, PC Magazine, October 25, 1994

Video acceleration and multimedia upgradability

- Software video acceleration with support for Microsoft DCI
- VM-Channel and PowerPlay64 support with **MGA Video XL** upgrade module gives you:
- Superior, full screen video playback at 1280 x 1024 @ 30 frames per second
- Multimedia upgradability by adding up to 15 video peripherals



MGA Impression Lite
$369 - 2 MB VRAM PCI



MGA Impression Plus
$449 - 2 MB VRAM PCI upgradable to 4 MB

Also available in VLB and ISA-bus.

Shipping Now!

1-800-361-1408
MATFAX: (514) 685-0174

Matrox Graphics Inc.
Tel: (514) 685-2630 Fax: (514) 685-2853

WinBench 4.0 scores based on 4 MB PCI boards using a PentiumP5-60, 16 MB RAM, 256KB cache.
©1994 All rights reserved. Matrox, Matrox MGA, Matrox QCDP, Matrox Instant Modeswitch are registered trademarks of Matrox Electronic Systems Ltd.
Notes:
(1)Requires 4 MB of VRAM.
(2) Only available with MGA Impression Plus

matrox

CIRCLE 124 ON READER SERVICE CARD

let you produce professional-level videos on the PC rather than having to farm them out to production houses. Media Suite provides full-screen, full-motion video; four channels of CD-quality audio; and high image quality. It also features nonlinear editing, which gives you instant random access to media clips and allows you to preview edits and experiment with different cuts. You can drag and drop clips into a time line, quickly assembling a sequence of "scenes." Media Suite imports and exports .AVI, .BMP, .DIB, .GIF, and .PCX files and is compatible with Microsoft PowerPoint and Adobe Photoshop.

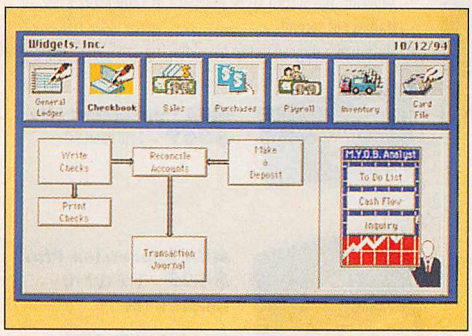
▶ **Media Suite Pro for Windows.** List price: *$9,995.* Avid Technology Inc., *Tewksbury, MA; 508-640-6789; fax, 508-640-1366.*

Circle 419 on reader service card

IMPROVED

Version 5.0 of M.Y.O.B. Hits The Market

BestWare has begun shipping M.Y.O.B., Version 5.0, the latest release of the company's small-business accounting software. One of BestWare's main objectives with this new release was to ease the initial setup process of the product. Consequently, BestWare has included a host of helpful features designed to get you up and running quickly. These include a CD-ROM of on-line help, an interactive on-screen interview, a



The M.Y.O.B. Analyst puts all the analytical tools you need at your fingertips.

new booklet of tips and suggestions, and a videotape about getting started. M.Y.O.B. also includes Easy-Fill and Easy-Add, two new features designed to expediate data entry. The M.Y.O.B. Analyst groups the program's analytical functions together for easy access, and the product also provides expanded data-zoom capabilities, batch report printing, professional forms, and expanded job-tracking capabilities.

▶ **M.Y.O.B., Version 5.0.** List price: *$119.95; with payroll functions, $209.95.* BestWare Inc., *Rockaway, NJ; 201-586-2200; fax, 201-586-8885.*

Circle 420 on reader service card

BRIEFS

The PF50 fits most laptop units, attaching with hook and loop fasteners. 800-553-9215; fax, 612-736-2298.

Matrox Graphics has announced what it calls a "low-cost, high-performance" 64-bit Windows graphics card. The MGA Impression Lite has 2MB of VRAM and comes in both PCI ($369) and VLB ($399) versions. The card manages up to 1,280-by-1,024 resolution with 8-bit color. It also supports 3-D games at up to 640-by-400 resolution with 16-bit color. The Impression Lite comes bundled with the MGA 3D-SuperPack CD-ROM, which includes 3-D games and development tools and a demo version of Caligari's trueSpace rendering software. 800-361-1408, 514-685-2630; fax, 514-685-2853.

Hardware

Fujitsu Computer Products of America has expanded its line of scanners with the introduction of two color scanners and three high-performance monochrome scanners. The $1,695 24-bit Color ScanPartner 10 has 10-page-per-minute throughput, 300-dpi resolution, a standard 50-sheet document feeder, and a SCSI interface. The $9,995 24-bit M3296G color scanner handles documents up to 11 by 17 inches and can produce 16 million colors and 400-dpi resolution. Fujitsu's new high-performance M3096EX ($5,995), M3099A ($24,995), and M3099G ($26,995) monochrome scanners are networked scanning solutions for high-speed, high-volume performance. 800-626-4686, 408-432-6333; fax, 408-428-0456.

And Finally. . .

Canon Computer Systems has restructured the pricing for two of its Bubble Jet printers, lowering the list price of the monochrome BJ-200e to $269 from $299. The color BJC-4000, originally listed at $549, will now list for $469. . . . **America Online** has announced plans to establish a World-Wide Web site on the Internet featuring a selection of screens and content from the on-line service, as well as trial memberships. . . . **Compaq** has begun bundling an external floppy disk drive with its Contura Aero notebook computers.

IMPROVED

BitWare 4.0: More than Your Typical Upgrade

Cheyenne Software has begun shipping BitWare, Version 4.0, which goes above and beyond a standard upgrade by adding a host of expanded features, including advanced telephony. BitWare—formerly from Bit Software—still provides comprehensive fax capabilities, including faxing directly from any application, drag-and-drop faxing, and broadcast faxing. Fax-on-demand capabilities allow users to call in and choose from a menu of documents so that they can have one or several items faxed to them. BitWare 4.0 also adds comprehensive voice capabilities. Callers can leave messages in one or many voice mailboxes or select from many prerecorded voice bulletins, and you can configure the program to send an alphanumeric message to a beeper or forward faxes or voice messages to another telephone number. The program has OCR features, distinctive-ring support, mini-BBS capabilities, and scanning software.

▶ **BitWare, Version 4.0.** List price: *$199.* Cheyenne Software Inc., *Roslyn Heights, NY; 800-243-9462, 516-484-5110; fax, 516-484-3446.*

Circle 416 on reader service card

NEW

100MB Floppy Disks? Iomega's Zip Drive Is the Answer

For a removable storage solution that provides megabytes at an attractive price, check out **Iomega Corp.**'s Zip drive and Zip disks, which were recently introduced at Comdex. The drive is designed for out-of-the-box plug-and-play functionality and is expected to sell on the street for less than $200. Zip disks come with either 25MB or 100MB capacity and are available singly or in packs of five. Iomega claims that the Zip system has an average access speed of 39 milliseconds, with a maximum transfer rate of 1.3 megabytes per second. That may not be blazing speed, but for the size and the money, it seems fair enough.

▶ **Zip drive.** Estimated street price: *Under $200.* **Zip disk.** Estimated street price: *25MB version, $10; 100MB version, $20.* Iomega Corp., *Roy, UT; 800-777-6654, 801-778-1000; fax, 801-778-3450.*

Circle 418 on reader service card



17" Series

The Hyundai Power Savers

Hyundai Monitors Give You Savings Every Time You Turn On The Power

You know you can expect bright, brilliant colors and razor-sharp images from every Hyundai monitor. And now you can expect a wealth of savings every time you use one of our 14-, 15- and 17-inch monitors. By incorporating the latest in technology, our monitors save more energy, time and money.

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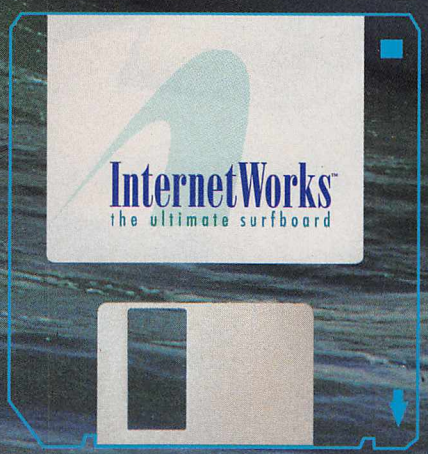
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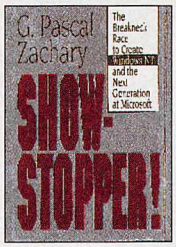
REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

Behind the Scenes as Windows NT Is Born

BY DON WILLMOTT

When the brilliant Dave Cutler walked away from Digital after a stellar 16-year career to join Microsoft in 1988, he probably didn't realize that the development of Windows NT, the project he signed on to supervise, would take five years, cost $150 million, and encompass 6 million lines of code.



It's a hard task to imagine, but *Wall Street Journal* reporter G. Pascal Zachary chronicles the history of the NT project in *Showstopper!* so well that he seems to have been at Cutler's side through the whole ordeal. It's a story as much about "the management of complexity" as it is about software, and Cutler's success yields important lessons.

Faced with demanding bosses (Bill Gates and Steve Ballmer), an unfamiliar corporate culture, incredible time pressure, and a goal that required as much vision as coding, Cutler found his way through. He succeeded by creating his own little world, filling it with several of his best Digital colleagues as well as top Microsoft talent, and then motivating everyone around him with a mercurial mix of inspiration and foul-mouthed terror tactics.

Zachary says that Cutler's best management innovation was to have people work in many small teams. Cutler had done that at Digital, even relocating his small group to Seattle to get away from the bureaucratic pull of Digital's Massachusetts headquarters. Within those teams, Cutler let individuals shine. In fact, the best management maxim to take away from *Showstopper!* is this: "Teamwork does not necessarily require the surrender of individuality."

Cutler was less successful when it came to understanding his team members' need to have private lives. Zachary goes into detail about the personal costs suffered by programmers who found themselves sucked into the vortex of a project so huge that every other part of their lives withered away. You know something must have been out of balance if the team relaxed by taking Formula 1 lessons at a California racing car school.

Zachary says that "Cutler sustained a mythic realm for both himself and his followers, in which the ambiguities of life were transformed into black and while, good and evil. . . .No one had a hold on him, not even Gates." And it worked, but let's hope that as Cutler tackles Cairo, the next version of NT, he encourages his programmers to go home to their families once in a while.

▶ **Showstopper!,** *by G. Pascal Zachary, $22.95; The Free Press, 212-702-2000; ISBN: 0-02-935671-7.*

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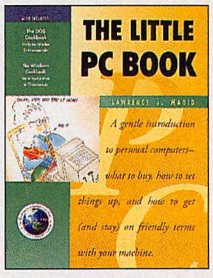
Big Baby Steps

BY SUSAN GREGORY THOMAS

You think *operating system* is a neo-Orwellian term for the government. The symbol "C:\" conveys about as much meaning to you as rock star Prince's new moniker. Random Access Memory is what your brain retrieves after a rough Saturday night. If you or anyone you know fits the above description, you'd best pick up a copy of *The Little PC Book.*

On-line and newspaper columnist Lawrence J. Magid's nifty little how-to book is for people entering—knock-kneed or heels a-draggin'—the electronic age. *The Little PC Book* assumes you know truly nothing about PCs, except that you should probably give in and get one. In clear, friendly language it serves up the basics: what the PC is, how to use it, and what to put into it. In fact, the only condescending words in the book are those that compose its tyke-like title.

Divided into four chapters—"Getting Oriented," "Putting Together a System," "Rules of the Road," and "Stocking Up on Software"—*Little PC* begins with the rudimentary and ends with the building blocks. Each chapter is broken down into bite-size pieces, sections no more than a few pages apiece, that give step-by-step instructions. After readers have graduated to full-fledged novice PC user status, they can turn to the back of the book and look up *recipes* in the "DOS Cookbook" and "Windows Cookbook." These two appendices contain useful tips on how to navigate and use the utilities in those operating systems, such as editing CONFIG.SYS and AUTOEXEC .BAT files in DOS and formatting floppy disks in Windows. A glossary at the very end makes for easy definition checking.

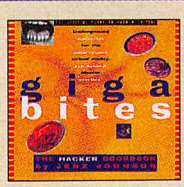


The book seems to *know* the kinds of questions that computer newbies ponder in real life—for example, "How is memory different from RAM?" and "Why would I *want* to edit my CONFIG.SYS file?" And like a classic children's book, it has great pictures. Each section is illustrated with cartoons, which depict characters both human and electronic relating (or wrestling) with each other. Besides humanizing the subject, these marginalia serve to convey some fairly complex technical phenomena, point out various system components, explain terminology, and give readers a good giggle as they muck their way through the ABC's of computing.

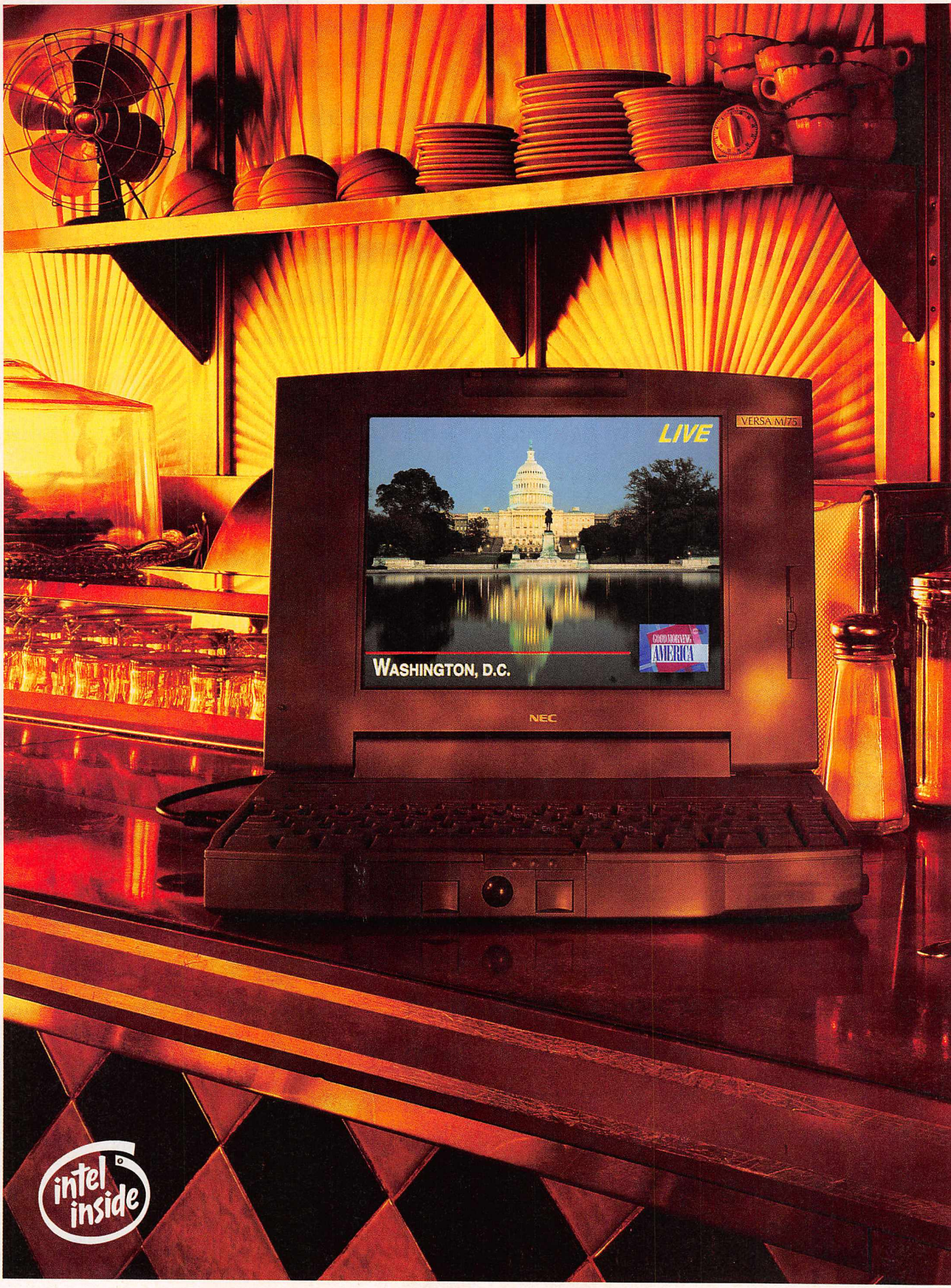
▶ **The Little PC Book,** *by Lawrence J. Magid, $17.95; Peachpit Press, 800-283-9444; ISBN:0-938151-54-1.*

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Read Only Recommends



Program like a hacker or just eat like one. Either way, Jenz Johnson's *Giga Bites: The Hacker Cookbook* is a truly serious culinary guide for those among us with silicon appendages. $9.95, Ten Speed Press, 800-841-2665, ISBN: 0-89815-644-0.


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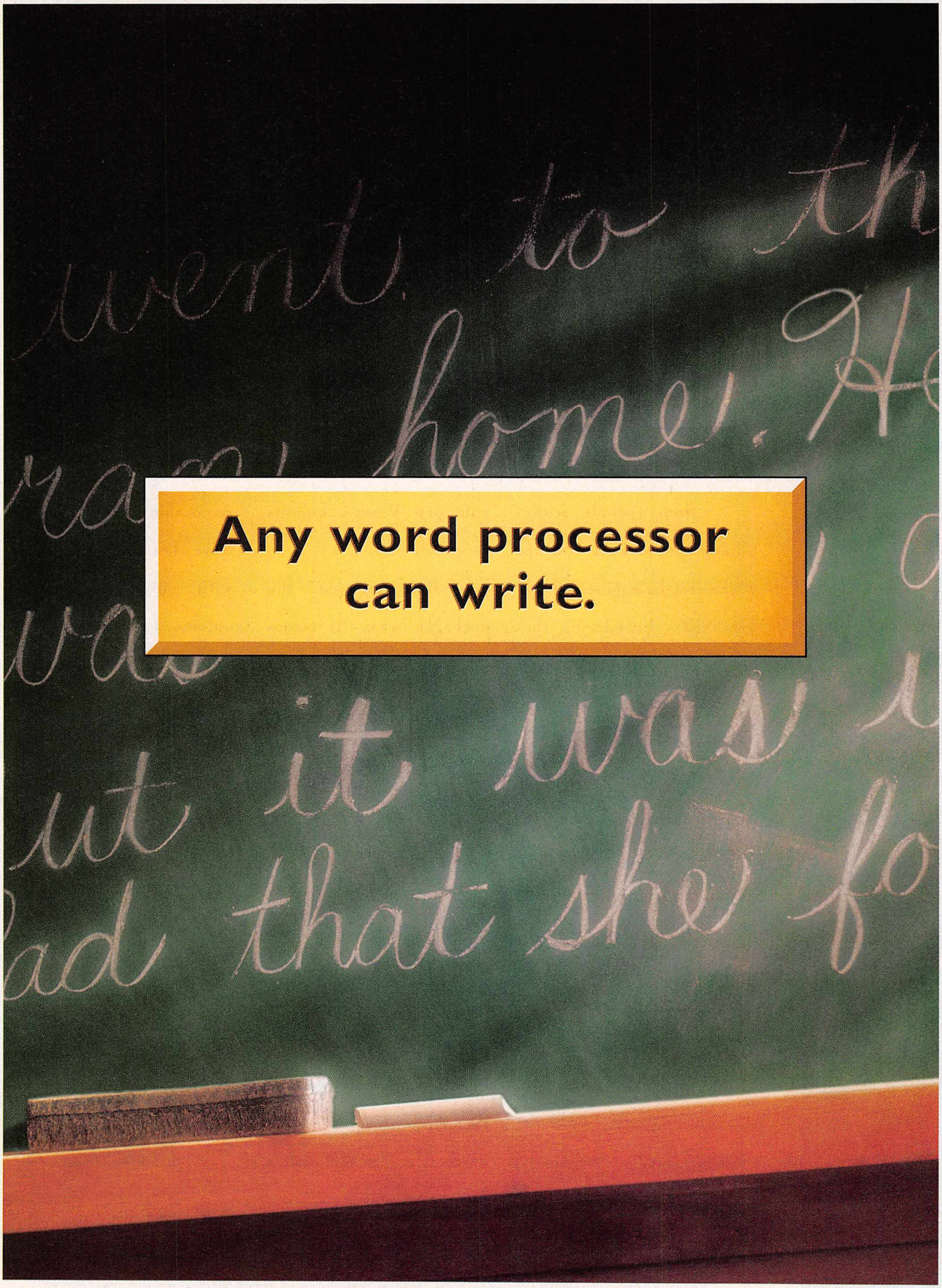
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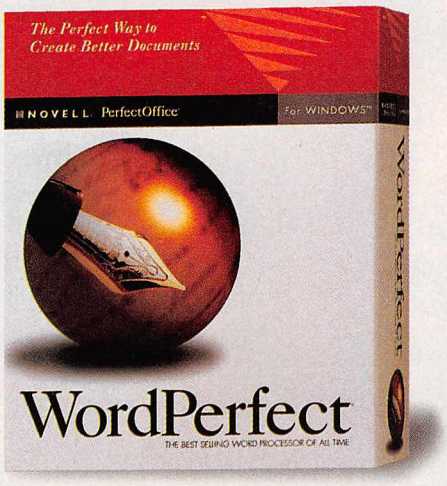
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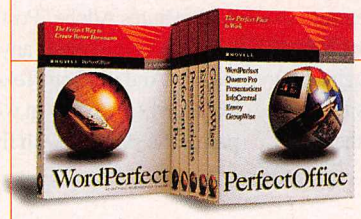
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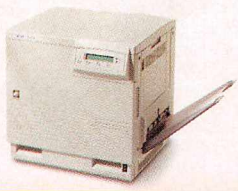
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Michael J. Miller

Notes from the Far East

While waiting at Tokyo's Narita airport to board my flight home, I took a moment to reflect on ten days of barnstorming visits to PC hardware manufacturers in Taiwan, Hong Kong, and Japan. At each stop on this Asian tour, PC Labs director Jim Galley and I had an opportunity to look at new computer technologies and to meet some of the men and women behind the development of many of the PC components we use back home.

While seeing new computer technology is always fascinating, the one thing that became clear to me on this trip is that we in the United States have a provincial view of the computer business. It's true that the most powerful, most affordable computers in the world are for sale in the U.S., but I think we tend to ignore the fact that much of the progress in both cutting costs and developing new technologies is taking place in Asia.

FIRST STOP: TAIPEI

In Taiwan, meeting with the heads of the world's largest manufacturers of PCs, motherboards, notebooks, and monitors was fascinating. I was surprised by how familiar the people I met were with the U.S. market, as well as with other markets around the world. It was obvious from the start that they didn't share the same provincial attitudes we have in the U.S.

Each company we visited in Taiwan has the same goal: to create quality products quickly and at a very low cost. Most Taiwanese vendors sell either components or whole products for resale. The reason for this is simple enough: Taiwanese manufacturers feel that the best way to combat intense competition is to cut costs. But this focus on cost doesn't translate into shoddy products. Far from it. To keep costs down, Taiwanese companies feel the need to keep returns down too, and that means making reliable products.

This focus on cost, however, tends to stunt innovation. The companies we talked with weren't so much interested in setting new standards as in meeting them. When research and development is needed, most depend on a government-sponsored centralized R & D effort. This tends to keep the companies competitive on standard technologies. Once a standard is set—be it in monitors, modems, or chip sets for motherboards—these companies then produce the products in volume.

Another interesting aspect of the Taiwanese companies we talked with was this: Most didn't seem particularly interested in having a brand name. They did most of their business as OEMs (original equipment manufacturers), selling products as components to other companies. One major exception is Acer, which is interested in both establishing brand-name recognition and playing the OEM game. Acer's plan is to set up related companies in many markets worldwide, each with local management and local final assembly sites for computers; in the U.S. its affiliate is Acer America.

WHEN IN JAPAN...

Many of the Japanese companies we met took a decidedly different approach to the business than the Taiwanese did. In Japan, I saw lots of new technology development in areas ranging from electronic flat-panel displays to printers to CD-ROM drives. Here, it was apparent, research and development flourishes, and cost cutting takes a back seat to having the newest and best computer components available.

The most interesting discussions I had in Japan involved LCD flat-panel screens, an area where the technology is evolving at an amazing rate. Most of the manufacturers I talked with were concentrating on TFT (thin-film transistor) active-matrix displays, and all believe there will be a lot more 10.4-inch screens available in 1995 as production yields increase and new



A whirlwind tour of Asia leaves lasting impressions on differing priorities.

Illustration by Edward Briant

Michael J. Miller

factories throughout Asia come on-line. That's great news, because the shortage of larger active-matrix LCDs has caused a shortage of some high-end notebooks, and caused other vendors to use smaller displays. Next year, the 10.4-inch display may well be standard on full-size, full-featured notebooks.

On the immediate horizon are higher-resolution active-matrix displays. Today's 10.4-inch displays show 640 by 480 pixels in standard VGA resolution. But the companies I met with expect that in 1995 they'll have in volume either 800-by-600 or 1,024-by-768 displays. Some of the vendors I spoke with want to go directly to the highest possible resolution because they believe that will set them apart from their competition. Others believe that 800-by-600 is enough for 10.4-inch LCD screens, because even on larger 14- or 15-inch CRT (cathode-ray tube) monitors, most people find resolutions greater than 800-by-600 uncomfortable. The dot pitch gets too tight and the fonts get too small at resolutions as high as 1,024-by-768. The good news for us is that we can expect to see high-resolution LCD panels on top-end notebooks next year.

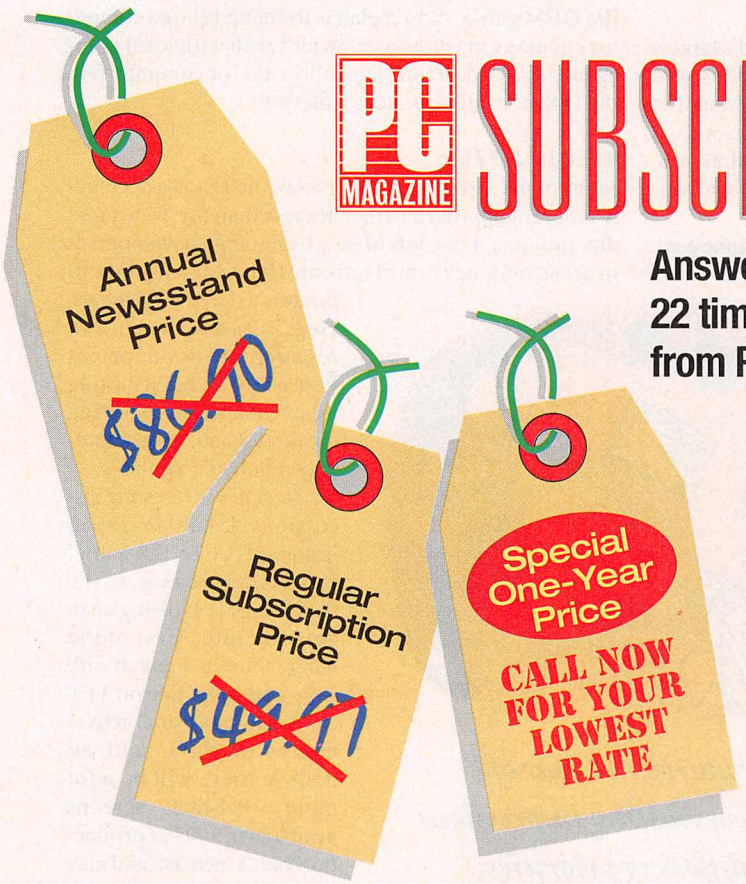
In the long run, many Japanese companies I met see flat-panel LCD monitors replacing power-hungry CRT displays on the desktop because of the high cost of electricity in Japan. It will, however, take years before flat-panel displays can be produced cheaply. Several companies already have 12-inch displays that support 1,024-by-768 resolutions, but these screens are for high-end engineering workstations. The largest LCD panels currently being demonstrated are a 16-inch screen from Toshiba and a 17-inch display from Sharp. Both of these panels are capable of 1,280-by-1,024 resolution.

A DIFFERENT WORLD

One thing to note is that the Japanese domestic computer market is extremely vibrant and very different from the American market. In Japan, NEC's 98 standard is the dominant operating system with its version of Windows; it shares market space with DOS/V and Windows, Macintosh, and Fujitsu's home-oriented FM-Towns systems.

The Japanese market is also much more focused on the home user than on the business user. We noted that the PCs the Japanese develop are being designed to take this into account. For one thing, being able to watch television on your PC is certainly possible in the U.S., but rather rare. In Japan, it's well on the way to becoming commonplace. And "monoputers" (computers with their monitors built-in) are much more common in Japan than they are here. On the whole, prices for computers seemed a bit higher in Japan, and we didn't see quite the emphasis on processor speed.

On my way back to the U.S., I thought about how different the PC business is in different markets. In terms of emphasis, vendors in Taiwan and Japan are as different from one another as they are from U.S. vendors. In Taiwan, cost is king. In Japan, emphasis is placed on research and development so Japanese manufacturers can deliver leading-edge consumer products. In the U.S., we see emphasis on just-in-time manufacturing, build-to-order assembly, and marketing. Most research and development is left to component and software companies. We see these kinds of differences throughout the world. When you put all of these factors—and all of these countries—together, you end up with a very competitive, very fast-moving worldwide computer market. □



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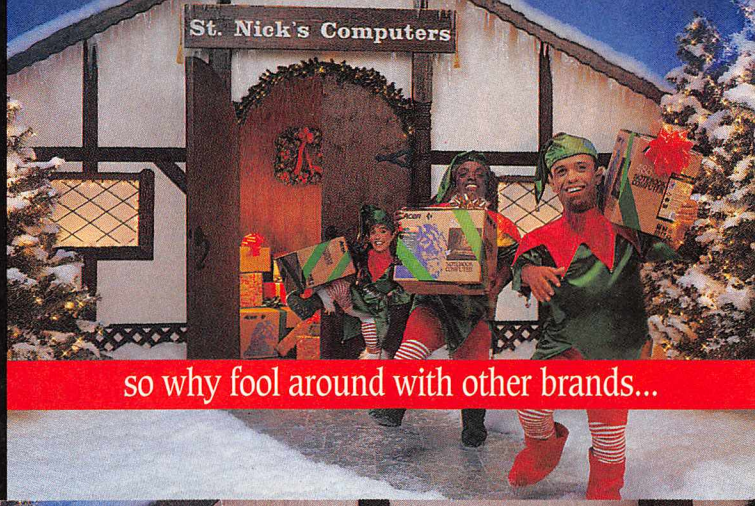
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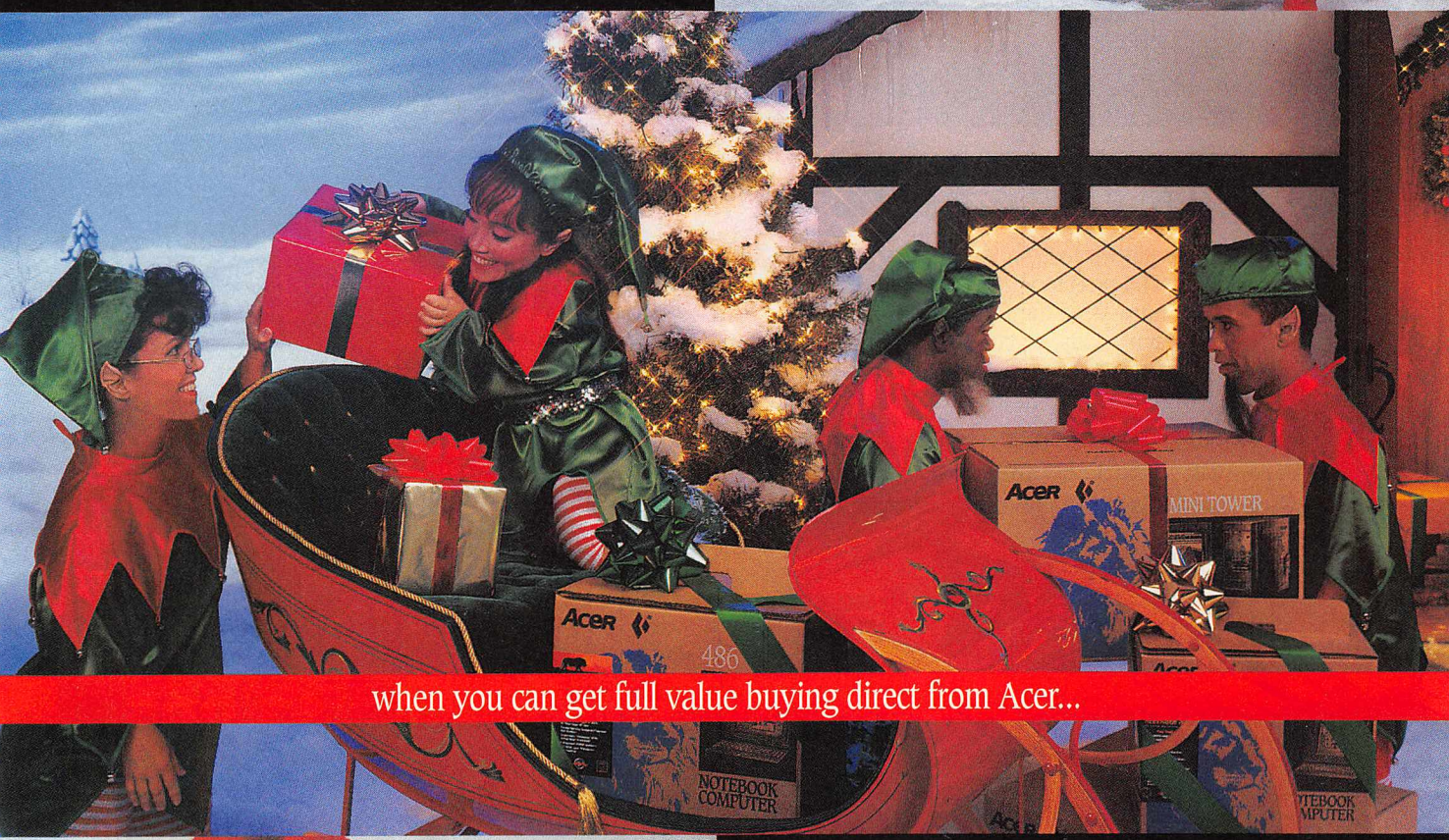
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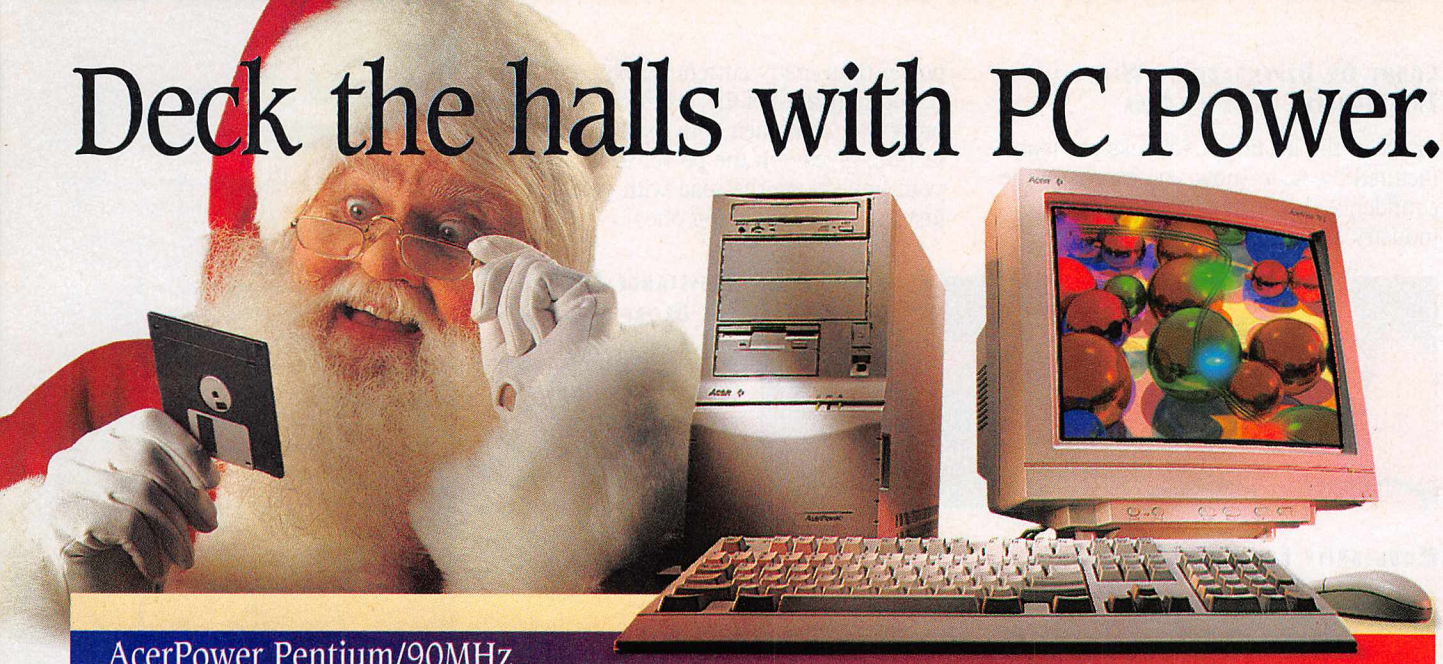
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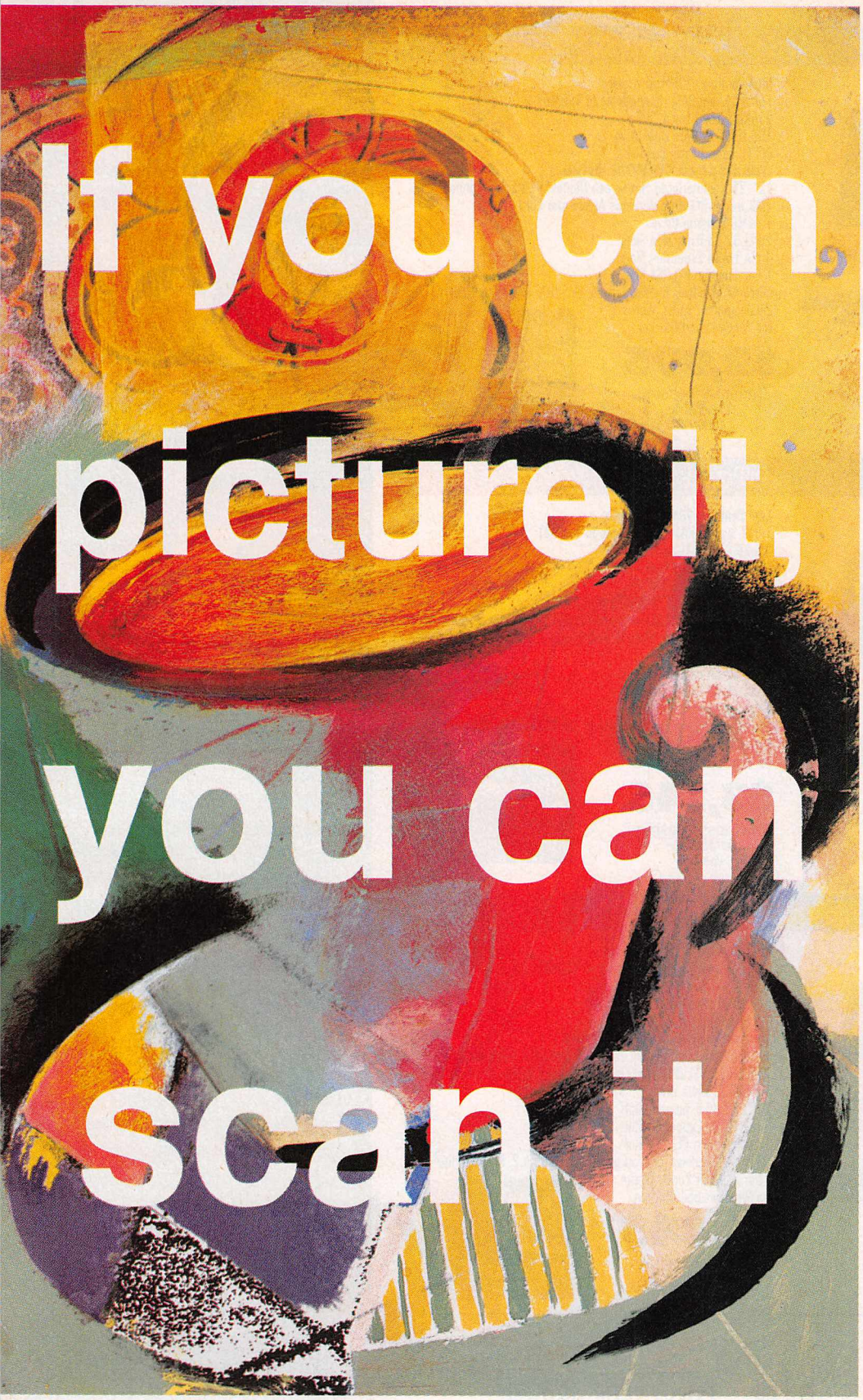
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Bill Machrone

How to Have Fun with Your PC

You probably thought you were having all the fun you could stand with your computer, but I assure you that there's much more in store. Today's multimedia machines open up worlds of possibilities. Here are some sure-fire ways to increase your fun quotient.

First, junk those crummy plastic speakers that came with your system. Get a decent three-piece speaker system with a separate subwoofer. Make sure it has enough power to make your pants legs flap in the breeze. These systems work well because low bass notes are nondirectional and one subwoofer can add the necessary bottom end for smaller left- and right-channel speakers. The amount of audio engineering that's going into today's best games and multimedia titles rivals that of records and movies. Only a good audio subsystem can let you hear all that the author intended.

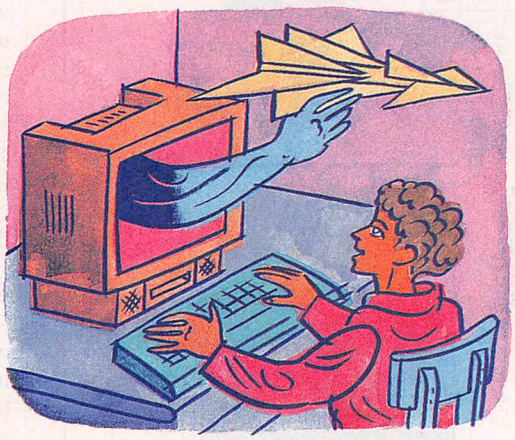
I've been using Cambridge SoundWorks' new SoundWorks system, designed specifically for computer applications. The satellite speakers are among the smallest available—3.5-inch cubes—yet they reproduce frequencies down to 150 Hz. The subwoofer measures 10 by 8 by 6 inches (HWD) and contains the amplifiers and a power supply. It has a normal AC cord instead of the annoying wall wart transformer that hogs socket space, yet it will also run on 12 volts DC if you ever need to take it on the road. I've long been an enthusiast of Microsoft's music appreciation CD-ROM series, covering Beethoven, Mozart, Schubert, Strauss, and others, but a full-range speaker system like this one hoists the music out of the realm of the academically interesting to truly compelling heights.

Games are much more fun with better sound. The eeriness of Myst, the sheer violence of DOOM, and the earnest silliness of Tuneland come across as never before. You could also use the SoundWorks system in a dorm room or bedroom along with a portable CD player. This is the best $199 you can spend on yourself and your computer. The only danger is that you'll finally be able to hear all the audio shortcomings of the Creative Labs Sound Blaster card, and you may be impelled to spring for a higher-quality card such as the Turtle Beach board.

MAKE IT LOOK BIG

Once you get the audio sounding good enough to share with a roomful of people, it's time to do the same with the video. I've used Digital Vision's TelevEyes Plus scan converter to drive a big-screen television set from my VGA board with surprisingly good results. I'm not going to suggest that you do your word processing or spreadsheets on the family TV set—even your loyal dog will leave the room—but there's a new breed of applications that are ideal for sharing.

Last week we had a paper airplane–making party at our house. My nine-year-old son invited half a dozen of his friends over, and we ran Kitty Hawk Software's Greatest Paper Airplanes on a laptop computer hooked to the big-screen TV through the scan converter. We had lots of paper and lots of patience as the software took the kids, step by step, through the intricacies of making planes that looked like fighters and starships. (Of course, some of them looked nothing like the intended design, but that's okay for fourth-graders.) Greatest Paper Airplanes features 25 different designs. Some are elegantly simple, others fiendishly complex. Expect to help until they get the hang of it. My daughter, three and a half years older, has considerable experience with origami. That, plus her greater manual dexterity, was a big help. She and I had made up a small fleet of planes the night before the party, which came in handy for dogfights and as replacements for the inevitable

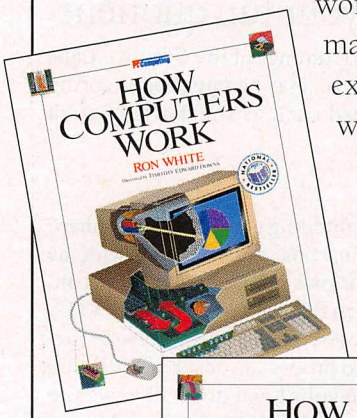


And you thought computers were the essence of pain and suffering.

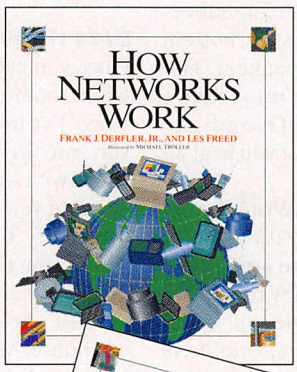
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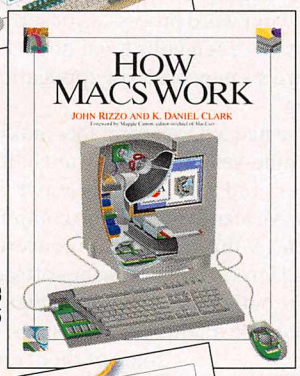
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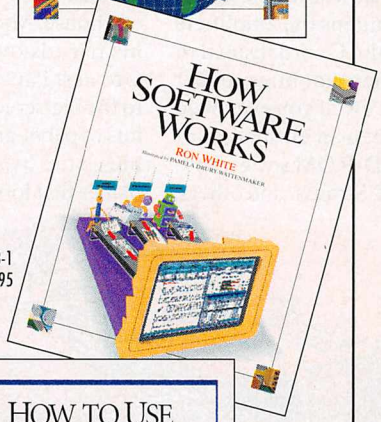
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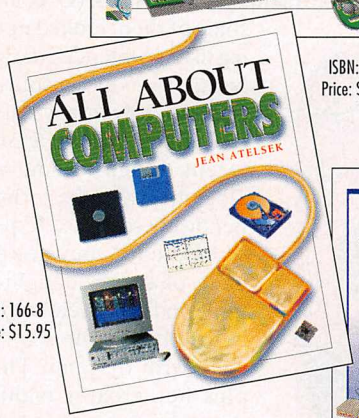
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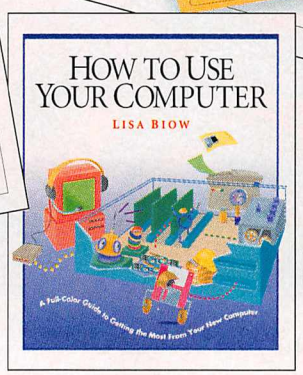
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Bill Machrone

losses as planes were crushed underfoot or crumpled beyond recognition.

Paper airplanes have suddenly become quite the computer fashion. While Kitty Hawk was first, with a 25-plane Windows application that fits on two floppy disks, WordPerfect's MainStreet Software has a CD-ROM called Paper Planes that's crammed with innovative and traditional designs. A third entry, Aviation, from Knowledge Adventure, is a tour de force that covers the history of aviation, shows movies of famous and historic planes, and includes a paper-airplane module. All feature simple, VCR-like controls that make it easy to back up when your plane-in-progress looks like one of Salvador Dali's nightmares instead of what's on the screen.

We ran the program on a ZDS Z-Noteflex, one of the new breed of multimedia laptop computers. The built-in audio made it easy to plug into the TV's surround-sound system; the kids loved the roaring, swooshing, zooming sound effects that accompanied the planes and Kitty Hawk's lighthearted history of aviation. The party was, shall we say, a soaring success. Once all the planes had been folded, the kids adjourned outside for a frenzy of flying. Our young pilots were happily engaged for nearly 2 hours of running around after their winged creations. That's a *long* time for fourth-graders.

MAKE WORK LOOK LIKE PLAY

Kids hate to study vocabulary and spelling words. Think of the fun they could have with word searches and crossword puzzles that contain their vocabulary words. Hide 'n Seek is a word-search game that can be played right on the screen or on paper. This $20 shareware program is a flat-out bargain. It lets you create your own word lists, print out puzzles and answer sheets, and control the difficulty of the puzzle in several ways. You can find it on ZiffNet. Please be sure to register your copy.

Crossword Wizard, by Cogix Software, will invent endless crosswork puzzles from its internal dictionary or let you create your own. You choose the words you want in the puzzle, and Crossword Wizard does the rest, aligning the words, building a matrix, and printing the clue list from its internal dictionary.

Fun on your computer doesn't come naturally. Make it happen. □

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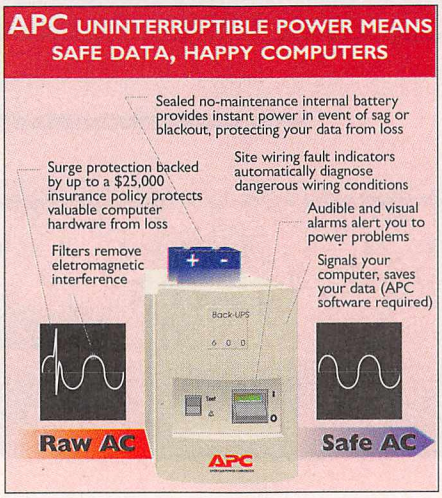
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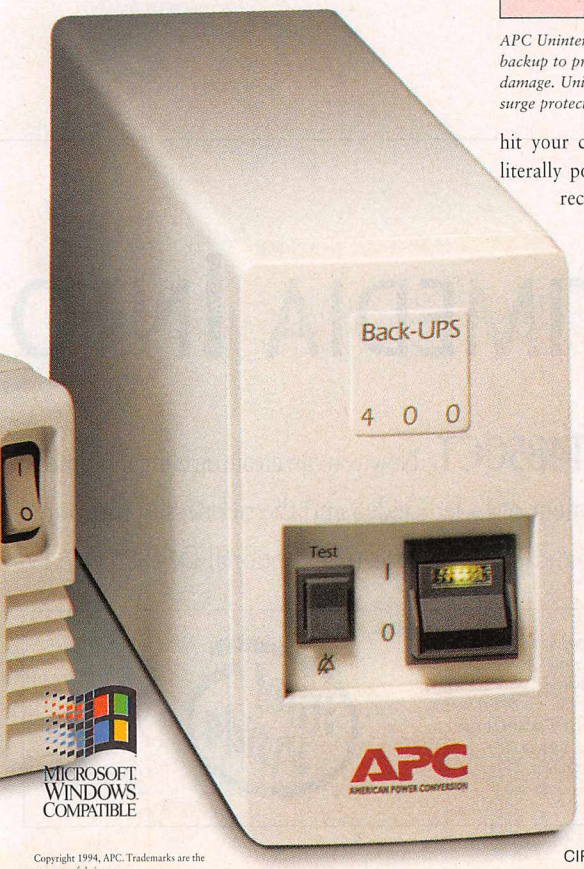
Just don't have the time for power problems on your PC? Don't worry. They'll always make the time for you. It's not if a power problem will occur, but when. Due to household appliances, poor wiring, bad weather or even other office equipment, power problems are as inevitable as death and taxes.

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C. Jeffrey, C. Jeffrey Eng.

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- ZEOS 101-key space-saving keyboard.
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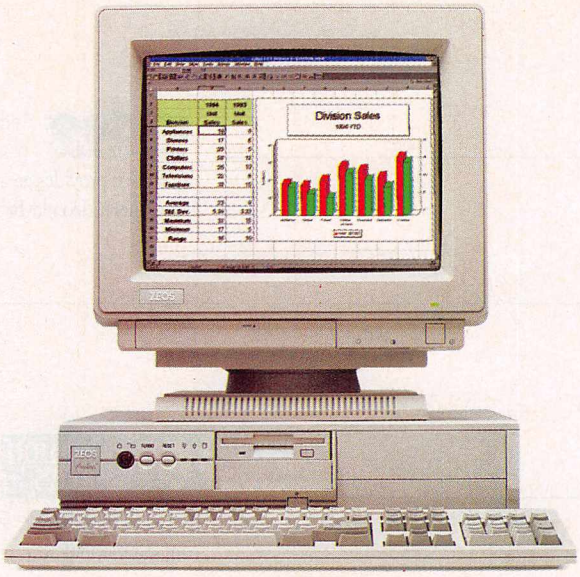
486SX-33	**$1195**
486DX-33	**$1295**
486DX2-50	**$1295**
486DX2-66	**$1345**

- 4MB RAM
- 214MB IDE hard drive, 32K cache
- 3.5" 1.44MB floppy drive
- On-board VESA local bus SVGA color video
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse

Package 2

486SX-33	**$1395**
486DX-33	**$1495**
486DX2-50	**$1495**
486DX2-66	**$1545**

- 8MB RAM
- **528MB IDE hard drive, 120K cache**
- 3.5" 1.44MB floppy drive
- On-board VESA local bus SVGA color video
- ZEOS 14" 1024 x 768 NI SVGA color monitor, .28mm dot pitch
- MS-DOS 6.2, Windows for Workgroups 3.11, Microsoft Mouse



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CIRCLE 038 ON READER SERVICE CARD



John C. Dvorak

Peekaboo, I See You

Within the next 24 months, we'll all be plugged into a personal conferencing system. You'll have a camera in your face and have partial control of a camera in somebody else's face. Like it or not, personal conferencing is the next revolution.

Integrated Services Digital Network (ISDN) produces a fairly high quality, full-motion video image that can be transmitted over the phone system and over a corporate network. We'll all be lining up for this service once we understand that it's more than a glorified picturephone.

While the cynics out there see personal conferencing as a vehicle for phone sex (which it may well become), its uses are much more broad and interesting. These include:

1. Video bulletin boards. There's no reason you can't attend the fireworks at the Washington Monument if some local fellow wants to bring his camera to the scene and let you plug into his BBS. I imagine that someone with addressable cameras located all over his house and reachable via a BBS would provide hours of entertainment for anyone who simply wants to watch how others live. Voyeurism, as it were.

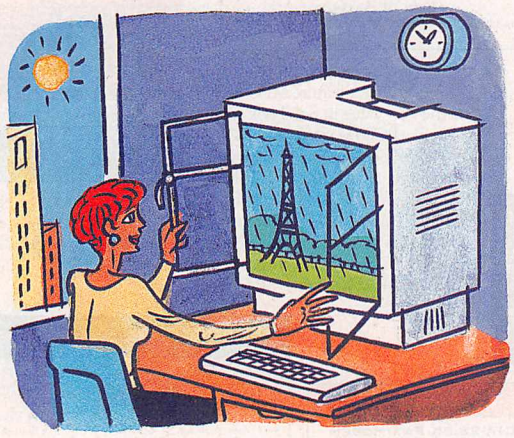
2. Real-time traffic and weather. Taking a trip to Paris? How about calling a weather BBS with a camera on the top of the Eiffel Tower overlooking Paris? The weather report says rain, but the camera shows sun. You pack accordingly. You want to drive into Silicon Valley at 2:00 P.M.? Dial up the traffic BBS and look at the freeway interchanges in real time to see if you really want to leave at all.

3. Personal calls. The universal picturephone. While people have traditionally hated the idea of such a device, they'll warm up to it once it becomes universal. If you don't want someone to see you, then send a fax or use e-mail, instead. If everyone is hooked to a picturephone, then e-mail will finally boom! But when you make a phone call, expect to be seen. No more surprises about what that person "with the great voice" actually looks like.

4. Crime prevention. Little brother is watching. Cameras and video BBSs will have us guarding our property remotely. Are some punks running up and down the street breaking car antennas? Now you can have it on tape. The face of crime could change drastically if the whole community can watch everything.

5. Spying. There's a downside to everything, and spying on employees (and friends, too) is the downside to this technology. With each workstation within a company hooked up to a camera and a microphone, few employers will resist the temptation to spy on employees. A great accessory will be a glue-on device that can hold a photo in front of such cameras. The photo will show the worker studiously busy in the cubicle.

It's easy to imagine another hundred uses for personal conferencing technology. Video data will become more important than ASCII data in the years ahead, just as the visual medium of television has surpassed written material in newspapers in prominence. The point is that the revolution that gave us computers is about to take another leap. To get there from here, we can't rest on our laurels. It's going to take powerful machines and processors. It's also going to require us to get more involved with our local phone-service providers and to get them on the ISDN bandwagon. This means personal activisim.



More than a vehicle for phone sex, personal conferencing will launch the next computer revolution.

At first, there will be plenty of confusing and incompatible standards for personal conferencing, but these things usually shake out faster than you'd expect. I for one will follow this technology closely. All I can tell you now is that it means another few rounds of buying faster machines with bigger hard disks. So get out your pocketbooks once more.

Illustration by Edward Briant

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CIRCLE 177 ON READER SERVICE CARD

John C. Dvorak

Inside Track

As we go into 1995, the 486, 486 clones, Pentium, and Pentium clones are **dominating** the scene. Still, Motorola is storming ahead with the PowerPC, upping the performance ante while making no difference in the market whatsoever. IBM, which fumbled its Personal PowerPC rollout, didn't help. Since the PowerPC 620 has been introduced and since Apple will roll out a PowerPC 604 in March, you have to wonder what IBM will do with a rumored **warehouse full of unsold** 601-based machines. IBM must either dump them or sell them **dirt cheap.** The company should have bitten the bullet and incorporated Windows NT into the units. Here's the strategy it should have followed:

Chit-chat concerning the mysterious 615 chip—the one that's a combination PowerPC/486—has bubbled to the surface again. Exactly how a machine utilizing this chip would do in the marketplace is unknown.

Last June: Roll out the PowerPC with Windows NT. Develop the Windows NT front end for the Workplace OS. Substitute the Windows NT look-alike for the Workplace OS. Bundle it free with the PowerPC. Make the other plug-ins available (OS/2, Unix, and so on) for the Workplace OS and bundle them free.

The only possible excuse that IBM has for not using this strategy is that it **will buy Apple**, merge the two companies, and switch its emphasis to the **Mac OS.** If it brings out the Personal PowerPC using the above-mentioned strategy but intends to buy out Apple, then the strategy will confuse the market. So it waits for the Apple deal to finalize. There's **no other rationale** I can think of. Whatever the case, none of this bodes well for the **much-ballyhooed** Workplace OS.

To confuse matters further, chit-chat concerning the **mysterious 615 chip** has once again bubbled to the surface. This is the chip that's a combination PowerPC/486, which can run existing PC applications in native mode at Pentium speeds. Exactly how a machine utilizing this chip would do in the marketplace is unknown. At this point, I'd guess it would amount to little more than what OS/2 did. People run Windows and DOS apps with OS/2, but use few OS/2 applications. I suspect that IBM is aware of this phenomenon and suspects this chip may simply propagate the Intel platform.

Microsoft's feud with NeXT. A recent news report headlined "Microsoft Not to Invest in NeXT" seemed pretty **far-fetched** if you ask me. There are strategic reasons Microsoft should lock up NeXT technology. First of all, let's note that Steve Jobs and Bill Gates have been in a **mini-feud** since the inception of NeXT. Jobs made it clear that **he could do without Microsoft,** and Gates came out with a rather humorous comment to the effect that we need a new platform like NeXT the way the record industry needs a 50-rpm record.

Things worsened further when NeXT made a deal to provide IBM with its technology. Nothing came of the agreement. Now with **rumors of an IBM/Apple merger,** Microsoft must act to lock up NeXT in some way lest IBM take a serious look at its previous deal and actually use the NeXT technology as it should have in the first place.

The clue that something serious is happening comes from the spokesperson for Microsoft—Pam Edstrom. Pam is the **mouthpiece** not so much of Microsoft but of Bill Gates personally. She speaks for him. Bill is involved in some way, and these rumors should be taken seriously. I'm sure that Bill would like to **see Steve Jobs squirm** and maybe **beg for mercy** before any Microsoft investment takes place.

Genuinely Interesting Software Dept.: I usually don't plug a product that's in beta release, but I'll make an exception with the **superb KidMail Connection** from ConnectSoft (telephone 206-827-6467). Besides, it should be shipping when this goes to press. These are the folks who developed **E-Mail Connection,** the best general-purpose e-mail front end available for users of MCI, Prodigy, CompuServe, and Notes. E-Mail Connection is the universal e-mail collector and organizer everyone needs, especially for those who can't focus on a single source for e-mail. Highly recommended. Anyway, their newest entry is called KidMail (street price, about $35), a front end especially for children. It's got a variety of humorous desktop metaphors done in a Humongous Entertainment (Putt-Putt Joins the Parade, Fatty Bear) cartoon style that's **absolutely stunning.** Kids will love this software because it **makes e-mail fun.** If you have children and have introduced them to e-mail (usually they figure it out for themselves), you know they delight in getting messages from their pen pals. (These, of course, should be monitored.) The **real benefit** for the child is learning to form meaningful sentences and spell correctly. It's **amazing** how quickly writing skills improve when children must exhibit their skills in e-mail exchanges. An added benefit of KidMail is that parents control the "postage." This unique idea impressed me the most. To send e-mail, children must use **virtual postage stamps** that are doled out by the parents. If youngsters don't clean up their rooms, then no more stamps. Believe me, once children get into e-mail and want to hear from their friends, this can be a powerful argument. **Highly recommended.** □

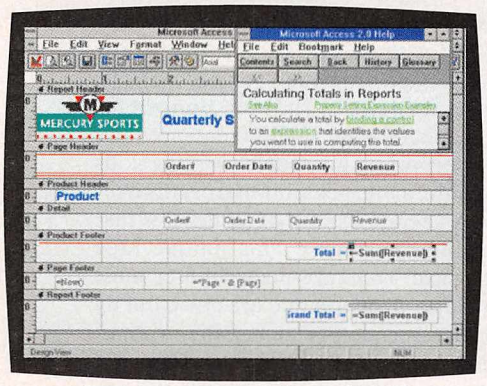
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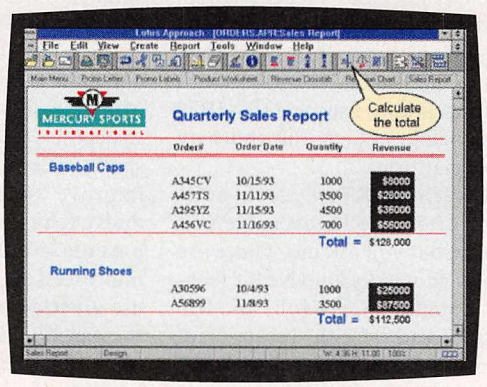
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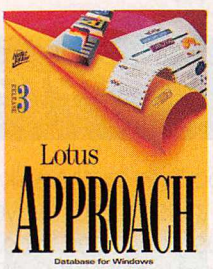
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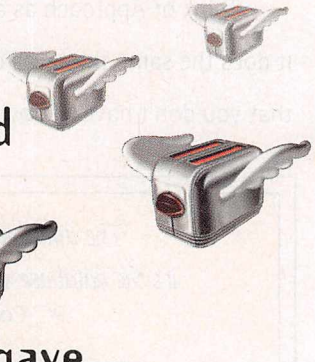


"FLYING TOASTERS"

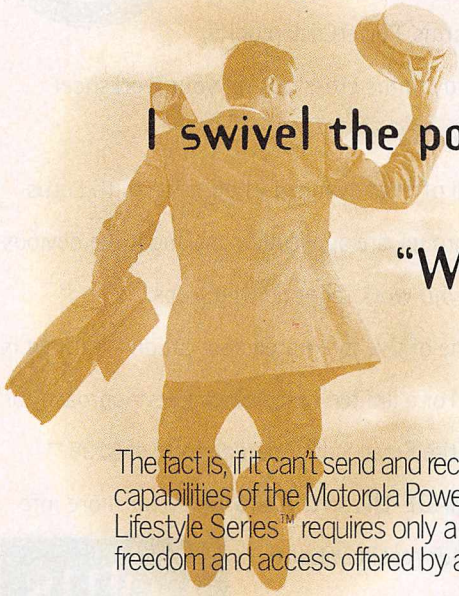
I'm in a boardroom the size of a small country surrounded by every guy I've ever competed with since junior high all in the same blue suit, nice tie and shiny shoes listening to a guy with a Napoleon complex tell us the first right proposal gets the business and something like half the property rights to Central America. Great. Countless portables are lined up on the table and everybody's watching flying toasters and taking notes. I pop in the Motorola Power Series™ modem Diane gave me this morning. By the time this Little Corporal throws his final glare I've sent the specs. As the suits file out, our proposal slides in. Right on the screen. I swivel the portable, wait, and interpret his grunt as positive. "We must talk."

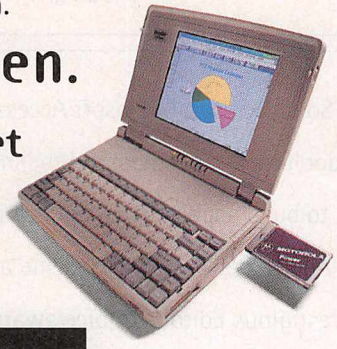












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CIRCLE 367 ON READER SERVICE CARD

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Jim Seymour

'Tis the Season...

Thanks to the perversity of publishing calendars, this issue, nominally our first of 1995, may arrive in your hands a week or more before Christmas 1994. Since that's near the peak of the holiday gift-giving frenzy, I want to suggest some PC-related products you may have overlooked this year, though they would fit well under someone's tree—perhaps your own.

This was the year CD-ROMs exploded, and also the year notebook PCs replaced desktops for many of us. Unfortunately, those two trends butted heads, for adding a CD-ROM drive to a notebook can be difficult.

Good portable, external CD-ROM drives are available from several companies, including NEC, Toshiba, and ZDS. But my favorite portable CD-ROM drive is MediaVision's newly revised Reno. This is a tough, sylish, double-speed drive with 180-ms access times, and it connects easily through either a PCMCIA SCSI-2 card or a parallel-port SCSI cable.

MediaVision had a rough year in 1994, following the departure of its chairman, Paul Jain, amid allegations of misdeeds. So there wasn't much money to advertise the Reno when it sneaked onto the market last fall. But at $300 (all prices here are typical street prices), it's a winner. Tip: Connecting the Reno to your notebook through a PCMCIA card, such as Future Domain's sensational SCSI2GO ($225), makes the most of the drive's speed, but Trantor's slower MiniSCSI-Plus interface-in-a-cable system ($139) works well and costs less, too.

FUN STUFF

If you're looking for something a bit more entertaining, two of the most engaging products of 1994, Fractal Design's Dabbler and Wacom's Art Pad, are available right now in a $175 bundle. Dabbler is a gas, what every PC paint program ought to be. And the tiny Wacom drawing tablet and its cordless, pressure-sensitive stylus are the right tools for the Rest of Us—the nonartists of the world who nonetheless like to...well, *dabble* a little. There's more fun and creativity here than you'll find in a hundred bad CD-ROM games.

Thinking about other hardware, but you already have a mouse? Take a look at Microsoft's new Home Mouse, especially if computer mice have always felt big and clunky to you. Its slightly smaller size and lower profile make it ideal for smaller hands, and at about $40, it's a great present.

If desktop style is the issue, don't miss Logitech's new Sensa Mice. They're available in several colors and patterns, including an elegant burled-walnut model, for about $60.

Logitech has just shipped its $50 Wingman Extreme, the most realistic joystick I've used. It's heavy enough that it doesn't walk around on your desk, but not so heavy that you can't keep it in your lap if you prefer. The big rubber buttons and smooth action give it a great feel.

In software, Visio HOME, now in Version 3, is a nifty $49 product for the kind of simple drawings, charts, and maps that most of us undertake on our home PCs. It uses the same stencil metaphor and drag-and-drop drawing engine as the standard version of Visio, which means it's fast, smart, and upgradable.



1994 was the year CD-ROMs exploded, and notebook PCs replaced desktops for many of us.

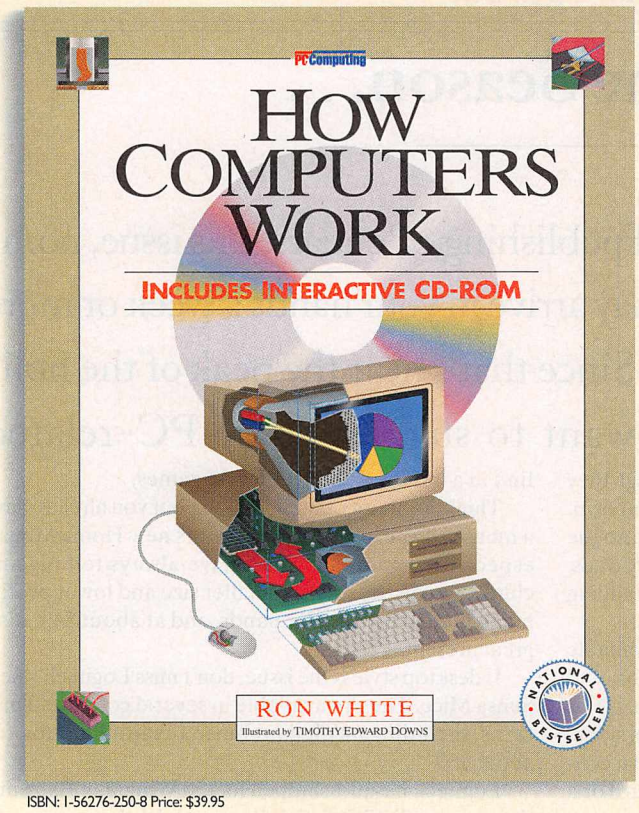
CD-ROM STARS

Among the latest batch of CD-ROMs, the standouts are the new titles from Dorling-Kindersley, the British publisher that first earned a place on our bookshelves with David Macauley's *How Things Work*.

Macauley's book has been transformed into an even better $80 CD-ROM, with the élan characteristic of D-K products; this is a must-buy. Take a look at D-K's *Ultimate Human Body* ($50) and *Encyclopedia of Science* ($70) titles, too. Young kids will absolutely eat up D-K's $40

Illustration by Edward Briant

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Jim Seymour

My First Amazing Incredible Dictionary, which features 1,000-plus spoken words accompanied by witty animations.

Whether you think 7th Level's new Monty Python's Complete Waste of Time ($60) is aptly titled or not depends on whether you're a Python buff. I am, and I love it, but if Pythonesque humor escapes you, don't waste your time. On second thought, even if you aren't fond of being insulted by Messrs. Palin, Cleese, Idle, Chapman, and Jones, at least look at the disk's Desktop Pythonizer; it lets you do things to your Windows desktop you won't believe.

Photo buffs will love Understanding Exposure ($60), a dazzling photo seminar on-disk from Diamar. Practically anyone who uses clip art will find Corel's $50 Gallery a bargain.

Microsoft Home's new CD-ROMs include a redesigned Encarta ($80), which has the most attractive and functional high-information-density interface I've ever worked with. Cinemania's been updated, too, and though its already busy interface is now even more complicated, it also has even more of that "consumer software" look Cinemania pioneered two years ago.

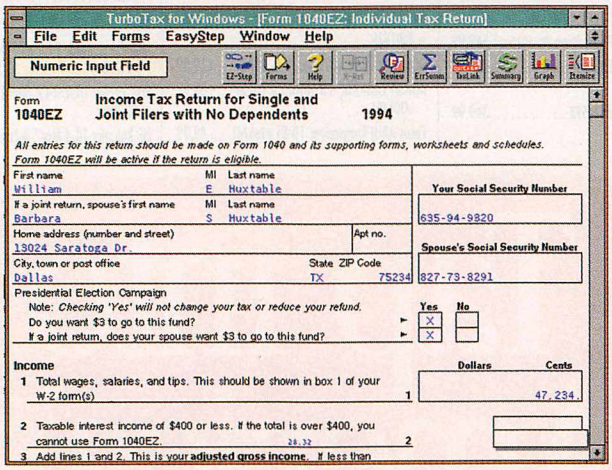
For kids, Microsoft's two new $39 Magic School Bus entries, The Magic School Bus Explores the Human Body and TMSB Explores The Solar System, are knockouts, capturing the manic energy of the hit TV show. I like Microsoft's $40 Dangerous Creatures title, too—the scorpion attack is especially cool—but I think it's probably too scary for kids under eight.

Speaking of kids, Logitech's MyMouse (formerly the KidzMouse) isn't new but is essential, I think, for young kids. It's tiny, well-shaped, and has immediate eye appeal for the five-and-under set. It's sold only at Target stores and costs just $20. Also welcome for small hands is Suncom's very nice $10 kid-size joystick, My Joy Stick.

Finally, two products from my column on PC sound in the last issue would make great gifts for friends. . .or maybe yourself. Cambridge SoundWorks' $199 amplified speakers are knockouts, and NuReality's $80 SRS sound unit, Vivid 3-D Plus, will improve *any* PC audio setup.

Have a great holiday, and remember to turn off the computer one chilly night, stoke the fire, listen for singing and sleigh bells, and revel in the nondigital, nonvirtual pleasures of this wonderful season. □

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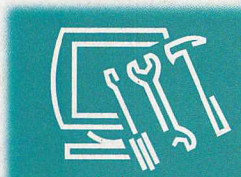
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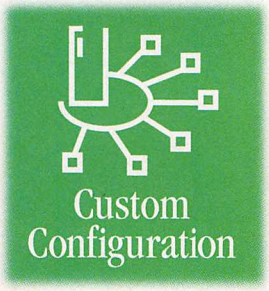
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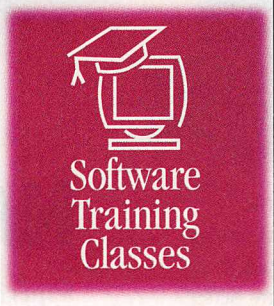
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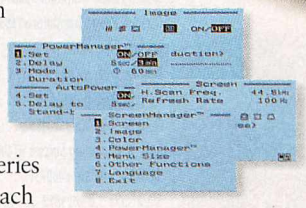
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Bill Howard

A Heavyweight Showdown

Think about potential trends in 1995 and you can probably name 5, 10, even 100. But really, there's only one worth watching: Microsoft and Intel duking it out for control of the computer industry and the chance to shape how information is gathered, manipulated, and distributed.

If the Intel model prevails, the world runs Intel-architecture PCs, with Windows as just one of many operating system possibilities. In this scenario, Microsoft is an important provider of operating systems and software, but the world doesn't revolve around Bill Gates. Intel supplies the CPUs, the support chips, the motherboards, finished boxes that system vendors slap their names on, and maybe—at some point—Intel-branded PCs.

If the Microsoft model prevails, the world runs Microsoft operating systems, mostly Windows but also Windows NT on multiple platforms. Microsoft also supplies the operating systems on PDAs, fax machines, and video servers, as well as the most popular applications software. In this scenario, Intel is just one of many CPU vendors, less able to call the shots on CPU pricing.

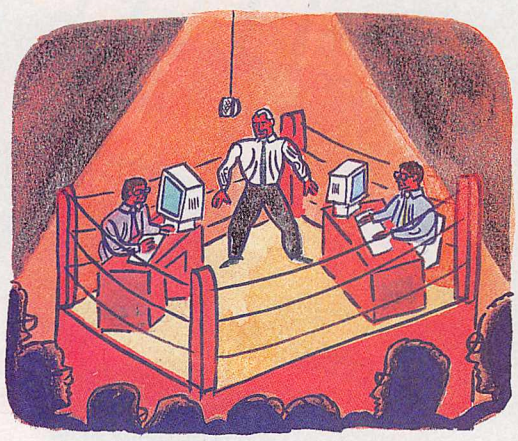
WHOSE SIDE ARE YOU ON?

Vendors are choosing up sides. Compaq, for instance, is both Intel's biggest CPU customer and its biggest detractor. Compaq hates all those clone vendors with limited engineering smarts that crank out pretty decent PCs using Intel building blocks. In Compaq's view, Intel is reducing system-building to a commodity business; the "Intel Inside" campaign aims to build brand recognition around one internal component. So Compaq is trying to turn the CPU into a relative commodity, which is why it's tossing money at virtually every clone-CPU vendor with Intel compatibility.

Then there's Digital Equipment Corp., which wound up in the Microsoft camp because it desperately needs a mainstream operating system to keep afloat the Alpha chip—not to mention Digital itself. It looks as if Digital's prayers will be answered by Microsoft's seal-of-approval requirements for Windows 95 applications software: To be certified, software must run seamlessly on Windows NT as well as Windows 95.

Both Intel and Microsoft are busy trying to expand the reach of their products. Intel, for instance, has a huge research facility outside Portland. The facility is designed to find new uses for the CPU, such as videoconferencing, putting CNN cable feeds in the corner of your monitor, even using the CPU as a sound board. Microsoft and Intel both want to get in on the marriage of the computer and the TV set; Microsoft is building video server software, and Intel is building set-top boxes. Who knows: Maybe an Intel box might wind up running Microsoft software, and we'll find nothing much has changed after all.

Microsoft is also heading into one area in which it's not directly competitive with Intel: consumer applications. With its purchase of Intuit, the Quicken company, we may finally see really useful home banking take off. The Intuit vision was brilliant, but initially most bankers gave Intuit the cold shoulder. This time around, they'll find it difficult to ignore Intuit/Microsoft. The cash flow from getting a fraction of a penny on every consumer and business transaction in a decade could be breathtaking.



Microsoft and Intel, the two companies everyone loves to hate (in private), continue their battle.

AND THE WINNER IS. . .

Whose vision will win out? Most likely these two giant sumo wrestlers will continue to bump bellies but neither will knock the other out of the ring. I suspect *x*86 will continue to be the dominant architecture but Intel will have to share the market with three or four vendors of *x*86-compatibles. Microsoft operating systems will dominate. Microsoft has an advantage, but it will be nullified by the government, which seems intent on finding something in the way of antitrust sanctions to pin on Microsoft. Let's watch. □

Illustration by Edward Briant

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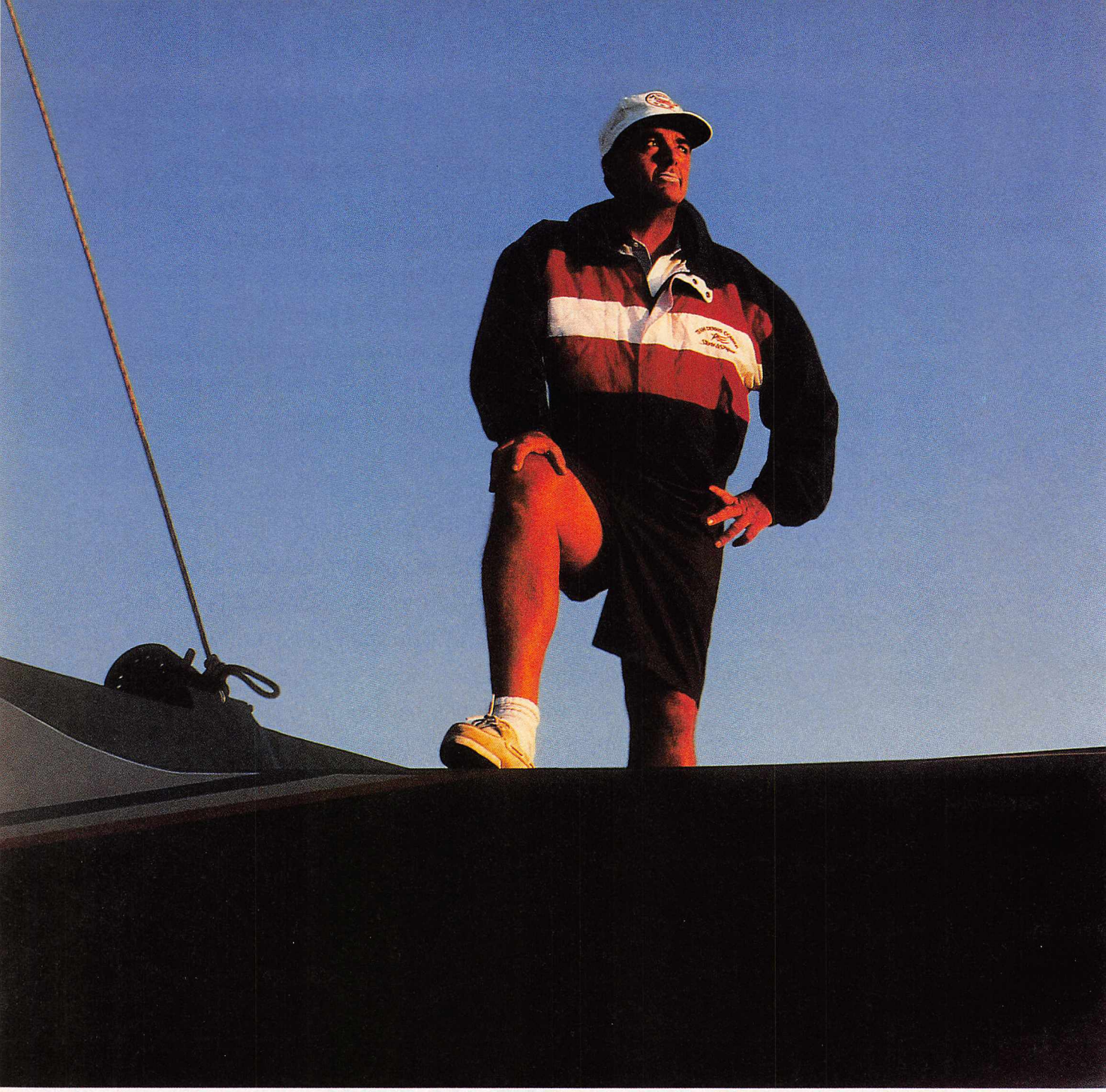
TEXAS INSTRUMENTS

PC MAGAZINE EDITORS' CHOICE
August 1994
TM4000M/25

SERVICE & RELIABILITY • PC MAGAZINE • READERS' CHOICE
July 1994

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CIRCLE 304 ON READER SERVICE CARD



As usual, Team Dennis Conner is well in front of the competition. But then, they have a history of firsts. In 1980 it was the Kevlar sails. In 1987, an innovative hull surface. In 1988, a sail that looked like an airplane wing. All of which resulted in America's Cup victories.

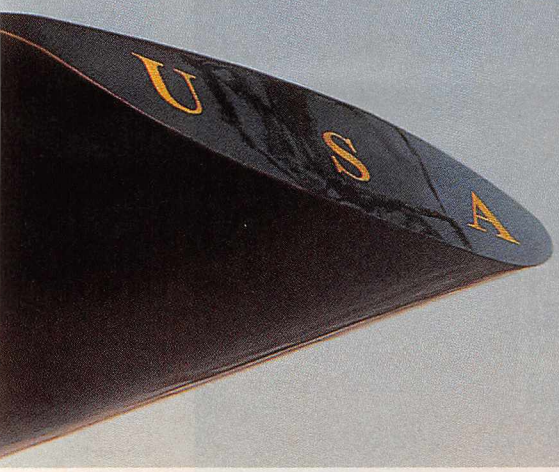
Of course 1995 should be no exception. Because D.C. has a new secret weapon. Microsoft® Excel 5.0.

With the leading spreadsheet for Windows,™ Conner's design team has the flexibility — and power — to calculate the results of thousands of test factors to determine an ideal boat design. Make the wrong choice and his team spends the rest of the race looking up somebody's boom. (Sound like your business?) Make the right choice and they're ten seconds faster than the next guys.

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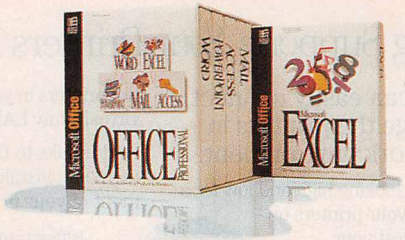
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HOW CAN HE LOSE IN MAY WHEN HE'S ALREADY 12.5 SECONDS AHEAD IN JANUARY?



useful information, and help you see what the other guys miss. The shortcuts.

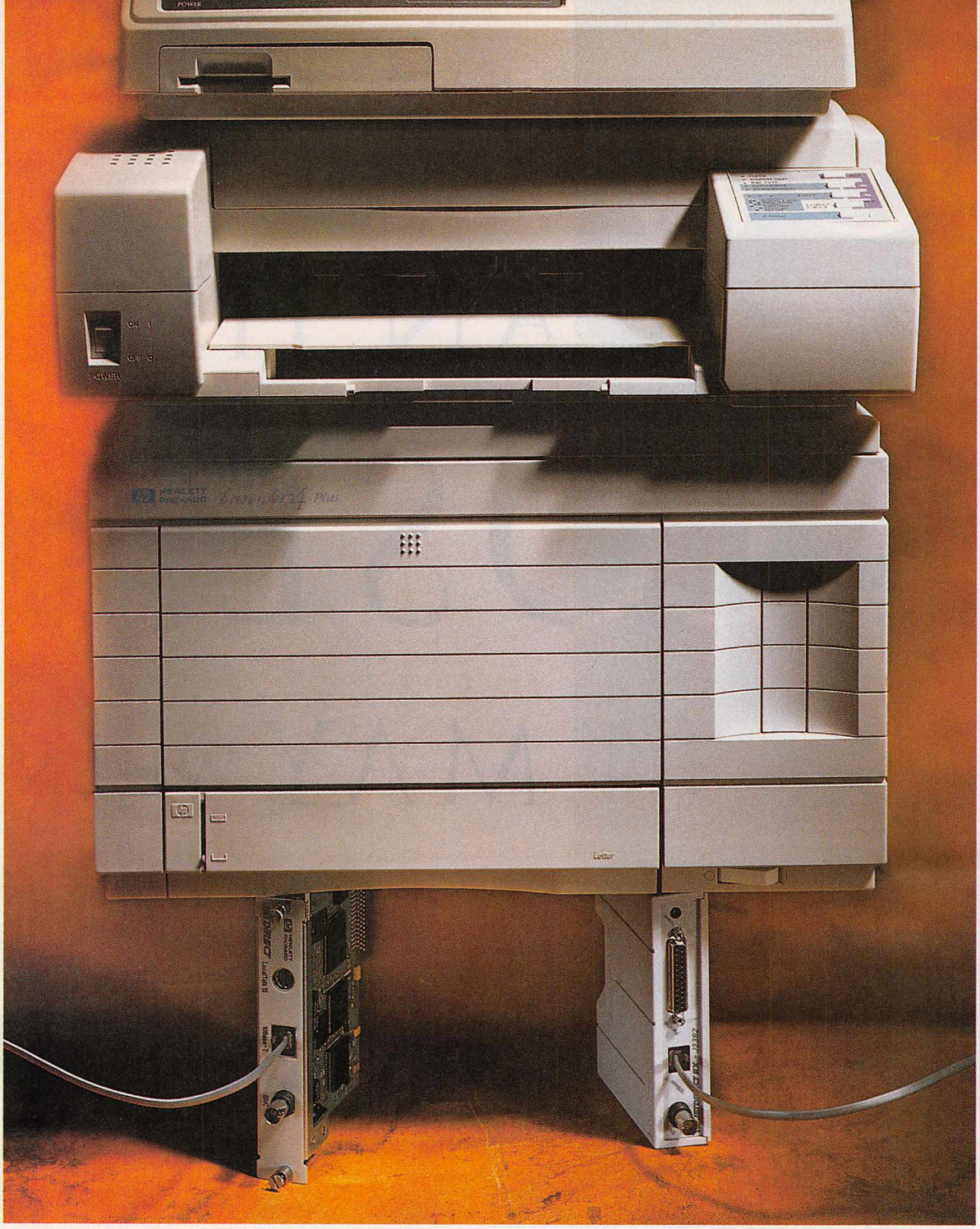
To put a little distance between yourself and the competition, call (800) 240-4782 Dept. XQV, and we'll send you information on Microsoft Excel 5.0 and the other programs that make up our winning team of Office applications.* After all, the race you're running probably isn't much different than Dennis Conner's. Because in the end, the only thing that matters is being at the last buoy first.



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The BEST of TIMES 1994 LAN TIMES

JetDirect EX External print servers support any parallel-based printer. JetDirect cards support HP LaserJet, HP DeskJet and HP DesignJet printers with I/O slots

NOS compatibility: Novell NetWare; IBM LAN Server; Microsoft LAN Manager; Apple EtherTalk; Apple LocalTalk*; Windows NT; Windows for Workgroups; UNIX: HP-UX, SunOS, Solaris, IBM AIX, SCO UNIX, lpd**

Network compatibility: Ethernet: 10Base-T, 10Base2; Token Ring (4/16 Mbps); Apple LocalTalk*

Multiple protocols with automatic switching

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THE BEST of 1994

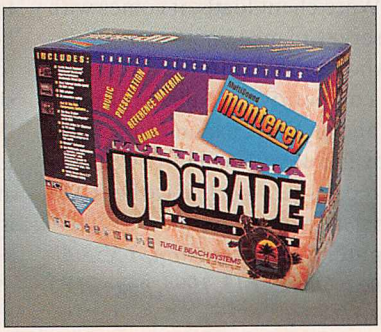




We evaluated thousands of products in the year just past. Here are the 50 that stood out from the crowd.

By Robin Raskin

The new year gives us all a great deal to look forward to, but usually hindsight is our best prognosticator. Our look at the best products of 1994 leaves us with that "brave new world" feeling. 1994 was the year when OLE became a reality (especially for those with well-endowed machines). It was the year that multimedia became a national mania, and the world of cyberspace welcomed (sometimes grudgingly) millions of new tourists. It was the year applications became richer in content than ever before, even as they added more graphics and sound razzmatazz. It was the year that Intel felt the heat of its competition and we reaped the benefits: more computing power for less money than ever before.



In the office, 1994 was the year when being connected became an intrinsic part of life—even when you were physically out of the office. It was the year when implementing client/server technologies went beyond an academic discussion. Lotus Notes F/X, Microsoft Visual Basic, and other new tools helped us cobble together the first bits of homegrown component applications.

It's a *PC Magazine* tradition to begin the new year with a look at the best products of the previous one. Here is a carefully selected group of past Editors' Choice winners, along with some of our personal picks. Together, they're the Best of 1994, and they're the jumping-off point for an exciting 1995.

Photography by Thom O'Connor

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Compaq Presario CDS 520



HP Vectra XU 5/90C



Dell Dimension XPS P90

SYSTEMS

- **Compaq Presario CDS 520**
- **Compaq ProLiant 1000**
- **Dell Dimension XPS P90**
- **HP Vectra XU 5/90C**

BY JOHN C. CLYMAN

1994 witnessed a rapid plunge in Pentium/90 prices and a resurgence of the home PC.

One of the machines that best typifies the reborn home PC is the **Compaq Presario CDS 520** ($1,957, estimated street price). The Presario is housed in an all-in-one case with a 14-inch color monitor, stereo speakers, and microphone. It contains a double-speed CD-ROM drive, sound card, and fax/modem with answering machine capabilities. The fastest CPU available is a modest 486SX2/66 from AMD—so it's not for power users. For home users, though, the satisfaction of getting a system set up and working with minimum hassle will be more important. (Reviewed: December 20, 1994, page 184.)

The **Compaq ProLiant 1000** is a far cry from the many self-proclaimed file servers that often are simply desktop PCs turned on their sides. Not only is the ProLiant 1000 an excellent performer under heavy NetWare client loads, it comes with some of the best server-management capabilities in the industry. And its price ($16,135, estimated street) is very competitive. Built around a 486DX2/66 CPU and an EISA expansion bus, the ProLiant 1000 is available with a Smart SCSI controller with mirrored, battery-backed cache RAM to provide maximal data integrity.

▶ Compaq Computer Corp., *Houston, TX; 800-345-1518. (Reviewed: October 11, 1994, page 217.)*

Circle 455 on reader service card

With basic configurations starting at about $3,700, the **Dell Dimension XPS P90** was an above-average performer on our Winstone 95 tests, setting the standard for high performance at a reasonable price. Packing a Sound Blaster 16 sound card, a Matsushita CD-ROM drive, an integrated PCI controller, speakers, and a 1GB IDE hard disk, the Dimension XPS P90 is perfect for small businesses that need lots of hardware for the price.

▶ Dell Computer Corp., *Austin, TX; 800-613-3355. (Reviewed: December 6, 1994, page 180.)*

Circle 456 on reader service card

If you think no one cares about engineering in desktop PCs anymore, the **HP Vectra XU 5/90C** will prove you wrong. Hewlett-Packard's attention to detail here is most apparent in the chassis and case design. No tools are required to open the system, and internal components are designed to lift or swivel out of the way to facilitate access. The front-panel buttons and indicators can be rotated to allow for either configuration. The Vectra's HP motherboard includes a Pentium/90 CPU (with a socket for a second Pentium), PCI and ISA expansion slots, and integrated Ethernet and SCSI connections. When equipped with 16MB of RAM, a 512K L2 processor cache, an Enhanced IDE hard disk, and a Matrox MGA video card, the $5,525 Vectra is an outstanding performer and a leader in design.

▶ Hewlett-Packard Co., *Palo Alto, CA; 800-752-0900. (Reviewed: December 6, 1994, page 198.)*

Circle 457 on reader service card

PORTABLES

• IBM ThinkPad 755C

BY JOHN C. CLYMAN

This past year, we saw more and more road warriors roaming airport lounges and shuffling into commuter trains. Their growing numbers continued to inspire ever tougher and better portables.

In 1994, the notebook that defined new standards of functionality in mobile computing and inspired envy among lesser-equipped road warriors was the **IBM ThinkPad 755C**. The ThinkPad 755C's stunning active-matrix color screen is one of the best in business; it's complemented by an Intel DX4/75 processor, 8MB of RAM expandable to 36MB, a hard disk as large as 540MB, built-in audio and 14.4-Mbps PCMCIA fax/modem, and the TrackPoint II pointing stick. At $6,383, the ThinkPad 755C isn't cheap, but then, the best rarely is.

▶ IBM Personal Computer Co., *Somers, NY; 800-772-2227. (Reviewed: August 1994, page 219.)*

Circle 458 on reader service card

• Toshiba Portégé T3600CT

We never thought we'd be satisfied with a notebook that had an undersize keyboard—until we used the Toshiba Portégé T3400CT and, later, the **Toshiba Portégé T3600CT.** The slightly cramped keys on the Portégé T3600CT seem somehow a fair trade-off for 4.4 pounds and a 6-hour battery life. The unit's active-matrix screen is also one of the finest we've seen.

▶ Toshiba America Information Systems Inc., *Irvine, CA; 800-334-3445. (Reviewed: August 1994, page 38.)*

Circle 459 on reader service card



IBM ThinkPad 755C



Toshiba Portégé T3600CT

WORD PROCESSORS

• Microsoft Word 6.0 for Windows

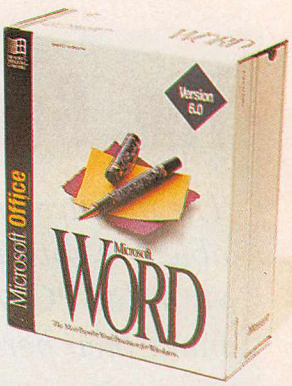
BY TED STEVENSON

Word processors have been heading toward automation for a while now: formatting your documents, helping you build macro connections to other applications, and making the most boring tasks effortless.

In a word—so to speak—**Microsoft Word 6.0 for Windows** automates writing and text formatting better than any other word processor; its balance of raw power and precise detail is unmatched. Much of Word's elegance is in anticipating what you need to do and doing it for you. Wizards, for example, automate tedious tasks such as creating faxes, calendars, and reports. The product has a keyboard shortcut for just about any function you'd care to name. At the other end of the scale, its macro language, WordBasic, offers programming power unsurpassed by that of any rival. Word may be big, but it's beautiful.

▶ Microsoft Corp., *Redmond, WA; 800-426-9400. (Reviewed: October 25, 1994, page 168.)*

Circle 460 on reader service card



Microsoft Word 6.0 for Windows

SPREADSHEETS

• Microsoft Excel 5.0

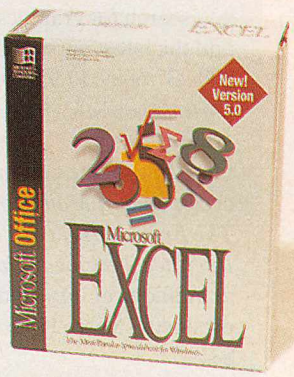
BY TED STEVENSON

The spreadsheet market shrunk this year, with fewer vendors offering fewer products. But the ones that remain are easier to use and offer more data-manipulation features and database query tools than ever.

Like its competitors, **Microsoft Excel, Version 5.0,** offers lots of features. What sets Excel apart is the depth and intelligence with which its features have been implemented. Microsoft has figured out what spreadsheet users do all day and lightened their burdens. The TipWizard, for example, tirelessly points out easier, more efficient ways to do your customary tasks, while the PivotTable Wizard is a rich reporting and analysis tool that lets you aggregate your data in just the right way to see the relationships that matter.

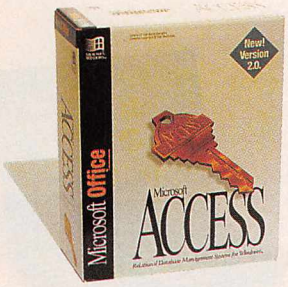
▶ Microsoft Corp., *Redmond, WA; 800-426-9400. (Reviewed: October 25, 1994, page 185.)*

Circle 461 on reader service card



Microsoft Excel 5.0

Our Contributors: ROBIN RASKIN is the editor of *PC Magazine.* RICK AYRE and DON WILLMOTT are executive editors; DAVID GREENFIELD is a senior editor; JOHN C. CLYMAN, GAYLE C. EHRENMAN, LEON ERLANGER, GAIL SHAFFER, TED STEVENSON, and LANCE N. ULANOFF are associate editors; and ELISABETH H. HOLZER and VICKI B. JACOBSON are staff editors of *PC Magazine.* BEN Z. GOTTESMAN is *PC Magazine's* software technical director and JIM SEYMOUR is a contributing editor. THOMAS MACE was the associate editor in charge of this story.



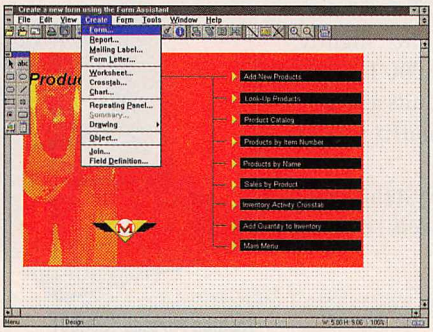
Microsoft Access 2.0

DATABASES

- **Lotus Approach for Windows 3.0**
- **Microsoft Access 2.0**

BY THOMAS MACE

For both database users and developers, 1994 was a good year. Just when we thought we'd seen the last word in end-user databases, **Lotus Approach for Windows, Release 3.0** ($495), hit the shelves. With one blow, it redefined our notion of what constitutes ease of use. Approach's clear tabbed interface lets you circumnavigate the product with ease, and its Assistants—Lotus's take on Wizards—are present in abundance to help you turn out forms and reports in record time. It is no developer's power tool, but it will get you up and running with basic apps, queries, and complex reports faster than anything else.



Lotus Approach 3.0

▶ Lotus Development Corp., *Cambridge, MA; 800-343-5414. (Reviewed: October 25, 1994, page 196.)*

Circle 462 on reader service card

Microsoft Access, Version 2.0 ($495), was a sneak attack. No one expected Microsoft's end-user database to unmask itself as the most sophisticated developer's database on the market. Amazingly, you don't have to be a sophisticated developer to work with it. Developers should know Access is the leader in engine-based data-integrity features. But if all you want is a mailing list, or even a complex report, Access's wonderfully clear interface and helpful Wizards will take you very far, very fast.

▶ Microsoft Corp., *Redmond, WA; 800-426-9400. (Reviewed: September 13, 1994, page 198.)*

Circle 463 on reader service card

Fun, Games, and More

The practical, the whimsical, the almost indescribable. We got a real grab bag of suggestions when we asked PC Magazine*'s frequent contributors to make their personal picks of the best of 1994.*



Microsoft Complete Baseball

If you subscribe to CompuServe, you'll want to look at the **CompuServeCD**, which will deliver a File Finder (letting you search for graphics files without incurring connect charges) and the latest version of WinCIM monthly. (CompuServe Inc., 800-237-6689; $7.95 per issue.)

Circle 505 on reader service card

The **Micro House Technical Library** on CD combines four of the company's technical reference books: *The Encyclopedia of Main Boards, The Encyclopedia of Hard Drives, The Encyclopedia of Peripheral Cards,* and *The Network Interface Technical Guide*, which list specifications and manufacturer information about thousands of hardware products. (Micro House International Inc., 800-926-8299; $349.)

Circle 506 on reader service card

The baseball season may have come to a premature close, but **Microsoft Complete Baseball** helped ease the emptiness for many of us. This multimedia CD-ROM includes a comprehensive history of the game, as well as all the player and team stats you could hope for and a melange of video and audio clips. There's even an on-line component that allows you to call up daily baseball scores and statistics during the season. (Microsoft Corp., 800-426-9400; $49.95.)

Circle 507 on reader service card

The **Home Repair Encyclopedia** on CD is a helpful working companion for complex jobs such as diagnosing and solving plumbing and electrical problems. The Paint Estimator, Concrete Estimator, and Attic Venting Estimator features help you determine what—and how much—you need to buy. (Books That Work, 415-843-4400; $49.95.)



Circle 508 on reader service card

Visio Home 3.0 makes it easy for even the artistically challenged to create great-looking maps, diagrams, greeting cards, floor plans. . .the list is endless. If you can click and drag-and-drop, you can create most anything you can imagine. The pack-

MULTIMEDIA HARDWARE

• MultiSound Monterey Multimedia Upgrade Kit • Sony CDU-33A

BY LEON ERLANGER

1994 was the year that multimedia CD-ROM title offerings exploded. The CD-ROM drive became almost as essential as the hard disk. Speakers, sound cards, and other multimedia gear approached the same level of popularity.

There are plenty of low-cost multimedia kits that are just fine for games and business applications. When it comes to multimedia authoring, however, the **MultiSound Monterey Multimedia Upgrade Kit** ($899) is in a class by itself. Many vendors boast that their cards produce "CD-quality sound," but Turtle Beach's claim is the only one proven by our tests. The Monterey features a high-speed, on-board digital-signal processor, which lets you avoid using a DMA channel and lets you record long samples without slowing down your entire system. For serious-minded MIDI and multimedia authoring, it is the only choice.

▶ Turtle Beach Systems, *York, PA; 800-645-5640. (Reviewed: October 25, 1994, page 157.)*

Circle 467 on reader service card



MultiSound Monterey Multimedia Upgrade Kit

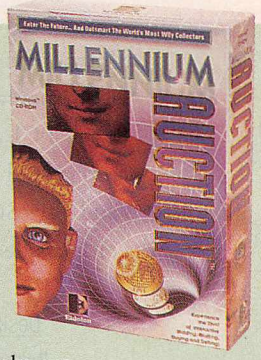
While we saw some impressive CD-ROM drives, the double-speed **Sony CDU-33A** stood out for its above-average performance at a spectacular $140 street price. The Sony CDU-33A ran through all our multimedia tests (except our most rigorous custom .AVI file test) without dropping a single frame. And even in the custom .AVI file test, its performance was better than many higher-priced drives. The Sony CDU-33A comes with a proprietary controller, so installation is easy. If you want a quick, inexpensive multimedia upgrade, you can't go wrong.

▶ Sony Electronics Inc., *San Jose, CA; 800-352-7669. (Reviewed: February 22, 1994, page 150.)*

Circle 468 on reader service card



Sony CDU-33A



age includes more than 900 predrawn SmartShapes that let any family member create useful drawings in a flash. (Shapeware Corp., 800-446-3335; $79.)

Circle 509 on reader service card

While Visio Home is endlessly useful, **Monty Python's Complete Waste of Time** is endlessly entertaining. This CD-ROM is chock-full of video highlights from the BBC-TV series "Monty Python's Flying Circus," as well as demented arcade games and the Desktop Pythonizer, which turns your tame Windows desktop into a loony landscape of rude sounds and bizarre icons. (7th Level Inc., 214-437-4858; $59.99.)

Circle 510 on reader service card

Far tamer but no less entertaining is **Millennium Auction**, a CD-ROM game that relies on visual style and intelligent gaming rather than violence for its appeal. This beautiful and engaging simulation casts you as an art buyer in a future world scenario; you buy and sell famous (and fanciful) works of art, attempting to amass the most valuable portfolio at the end of the auction. (Eidolon Inc., 718-884-7095; $69.95.)

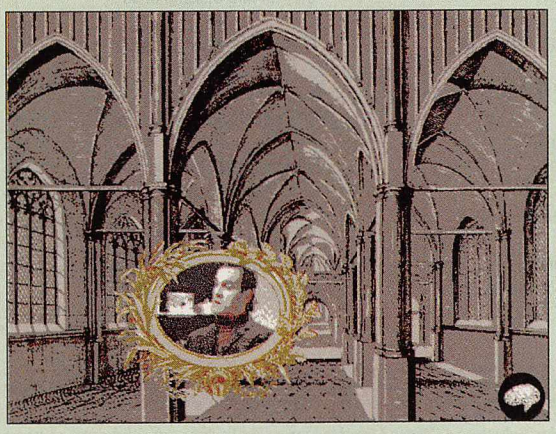
Circle 511 on reader service card

Myst helped us escape the din and sharp angles of Manhattan this year with its ambient music and elegantly rendered images of an imaginary desert island where we were left to wander around and through myriad worlds solving the game's central mystery. Myst is essentially an adventure game, but leaves out any inventorying device or time limits. (Broderbund Software Inc., 800-521-6263; $59.95.)

Circle 512 on reader service card

Crayola Amazing Art Adventure and **Crayola Art Studio**, two CDs designed for kids ages 6 to 12 and the 3 to 6 set, respectively, are designed to look like a kid's room, with the requisite coloring books, paints, markers, and connect-the-dots games. Toddlers can mix watercolors and design notepaper and certificates. Both also contain sets of games. (Micrografx Inc., 800-676-3110; $59.95 each.)

Circle 513 on reader service card



Monty Python's Complete Waste of Time

Putt-Putt Goes to the Moon is another can't-be-beat title for kids. This animated adventure for ages 3 to 8 helps young explorers to develop problem-solving skills as they find the objects necessary to return Putt-Putt to Earth. The animations are vivid, and every mouse click causes something to happen, making for nonstop fun. (Humongous Entertainment Inc., 206-485-1212; $49.95.)

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—Gayle C. Ehrenman and Elisabeth Holzer

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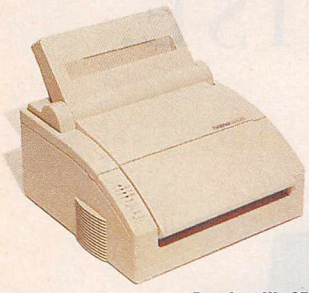
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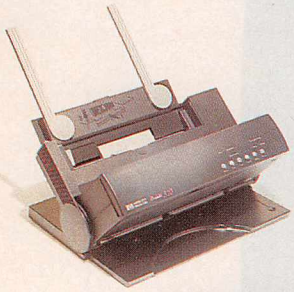
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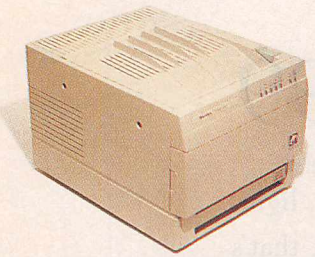
Brother HL-630



HP DeskJet 320



HP LaserJet 4 Plus



Tektronix Phaser 440

PRINTERS

- **Brother HL-630**
- **HP DeskJet 320**
- **HP LaserJet 4 Plus**
- **Tektronix Phaser 440**

BY LEON ERLANGER

Enhanced color was the big news this past year for every printing technology, from ink jet to laser. The continuing trend in laser printers was more features for less money. Our favorites this year include a budget-priced laser and a portable with top-notch output.

A crop of under-$400 laser printers have arrived, but the **Brother HL-630** was the only 6-page-per-minute unit among them. It offers more frills than you would expect for the price. Performance was better than average for a 6-ppm printer, and print quality was perfectly acceptable for the typical small-office/home-office user, with text printing its strong point. The small 13- by 14-inch footprint is great for congested areas, though you'll need another 5 inches to open the front output tray. If you're on a budget and you absolutely need laser-class output, the Brother HL-630 should fill the bill.

▶ Brother International Corp., *Somerset, NJ; 800-276-7746. (Reviewed: November 22, 1994, page 135.)*

Circle 464 on reader service card

If you need top-notch output while you're on the road or you simply need a printer that will take up the least space possible, the **HP DeskJet 320** ($379) offers excellent monochrome and decent color in a 6-pound ink jet measuring only 2.6 by 12.2 by 5.8 inches. Its print quality—both color and monochrome—is as good as HP's higher-end DeskJet 540 and better than average for an ink jet. Performance was excellent for a portable unit, and cost per page is a low 3 cents for monochrome text and 21 cents for 25 percent color coverage. Other portables are lighter, but the HP DeskJet 320 has features and performance that are clearly suited to both portable and desktop use. (Reviewed: November 22, 1994, page 273.)

Hewlett-Packard raised the bar again this past year in the laser printer market by offering a 12-ppm printer—the **HP LaserJet 4 Plus**—for the same price ($1,839) as its now-discontinued 8-ppm HP LaserJet 4. The LaserJet 4 Plus offers everything you might need in a high-end desktop/medium-size workgroup printer, including an Intel 80960 RISC processor for fast graphics output and 2MB of RAM (expandable to 66MB) with memory enhancement technology.

▶ Hewlett-Packard Co., *Santa Clara, CA; 800-752-0900. (Reviewed: November 22, 1994, page 148.)*

Circle 465 on reader service card

For true photographic-quality, continuous-tone output, the user's only choice is thermal dye transfer technology. While just about all the thermal dye transfer printers we saw this past year were impressive, the $7,995 **Tektronix Phaser 440** stood head and shoulders above the rest. Tektronix has added a host of image-enhancement technologies to minimize color dithering, ensure crisp edges, and reduce text jaggies with no apparent sacrifice in printing speed. A maximum image size of 9.3 by 12.7 inches gives you full bleed capability on 8.5- by 11-inch paper.

▶ Tektronix Inc., *Wilsonville, OR; 800-835-6100. (Reviewed: November 22, 1994, page 243.)*

Circle 466 on reader service card



Nokia Multigraph 447X

MONITORS

- **Nokia Multigraph 447X**

BY LEON ERLANGER

Seventeen-inch monitors have become the fastest-growing segment of the monitor market as their street prices have fallen. They have reached a low of $650 and users have begun to realize that a 17-inch display is ideally suited for working in the Windows environment.

We looked at several low-priced 17-inch monitors that were easy on the eyes, but for desktop publishing, graphics editing, CAD, and other high-end applications, the **Nokia Multigraph 447X** ($1,199) is the best performer. The Multigraph 447X offers 1,280-by-1,024 resolution at a flicker-free 76-Hz refresh rate and 1,024-by-768 resolution at 95 Hz. On-screen controls are plentiful as well as easy to use. Compliance with Energy Star, VESA's Display Power Management Signaling, and MPR II specifications are standard. Also included as standard with the Multigraph 447X are BNC connectors and a three-year warranty.

▶ Nokia Display Products Inc., *Sausalito, CA; 800-296-6542. (Reviewed: September 27, 1994, page 242.)*

Circle 469 on reader service card



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August 1994, WinBook XP
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PC MAGAZINE

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LAPTOP BUYER'S GUIDE & HANDBOOK

"...the WinBook XP is a great Windows PC, and an excellent value." "...the fact that you get the amount of performance we did from a battery charge speaks highly of the engineering that went into the WinBook XP." *LAPTOP BUYERS GUIDE & HANDBOOK*, First Look, Dec. 1994

COMPUTER SHOPPER

"In terms of value,...(the WinBook XP) ranks above many famous-name notebooks. And in terms of pointing devices, it's definitely got them out-numbered." "...if you're looking for a well-equipped, wallet pleasing portable, the WinBook XP deserves a spot on your short list." "...the WinBook with modem is $700 less than a comparably equipped, modemless (Dell Latitude XP) 475C." *COMPUTER SHOPPER*, PC Reviews, Nov. 1994

WINDOWS MAGAZINE

"The WinBook XP represents the best kind of innovation in the rapidly changing field of notebook computers. It keeps the best of proven technologies, such as a sharp display, and complements them with new technologies, such as those employed to stretch battery life. The long battery life makes it a good choice for anyone who needs a basic notebook that also delivers solid performance." *WINDOWS MAGAZINE*, WinLab First Impressions, Dec. 1994

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INPUT DEVICES

• Cirque GlidePoint Portable

BY DON WILLMOTT

1994 saw the advent of two new gadgets that allow you to avoid the tiny and inconveniently located trackball that is built into your notebook PC.

Users of the **Cirque GlidePoint Portable** found out what Apple PowerBook 500 users have known for some time: that your finger is the ultimate pointing device. The $99 GlidePoint is a touch-sensitive pad that is capable of tracking your finger movements to move your cursor. It does this by detecting changes in the surface's electrical field, so it has no moving parts; simply tap the pad to simulate a mouse click. It may sound implausible, but it really does work.

▶ Cirque Corp., *Salt Lake City, UT; 800-454-3375. (Reviewed: September 13, 1994, page 44.)*

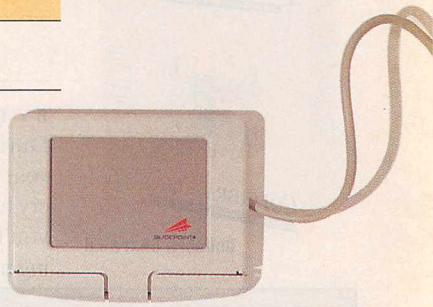
Circle 470 on reader service card

• Logitech TrackMan Voyager

Ergonomic is a word woefully overused to describe PC peripherals, but the $89.95 **Logitech TrackMan Voyager**, one of the cleverest peripherals we reviewed this year, has actually earned the adjective. You can use this palm-size, ultra-lightweight (2.8-ounce) trackball in many different positions and at any angle. Snap off its protective cover, slide on the adjustable clip-on device, and attach the TrackMan Voyager to the side of your notebook; it's similar to the Microsoft BallPoint, although it sits flush with the keyboard. Turn over the unit's protective cover and attach it the same way you attach the clip-on device, and the TrackMan becomes a desktop trackball.

▶ Logitech Inc., *Fremont, CA; 800-231-7717. (Reviewed: July 1994, page 54.)*

Circle 471 on reader service card



Cirque GlidePoint Portable



Logitech TrackMan Voyager

COMMUNICATIONS SOFTWARE

• AIR Series 3.0

BY RICK AYRE

This past year, a lot of the software that was supposed to get us all instantly connected to the Internet turned out to be disappointing. We found much of it both difficult to install and confusing to use; with some products, we even had to question whether they had been designed for use by human beings.

There were some bright spots amidst the general gloom, however. One product in particular that we looked at—**AIR Series, Version 3.0,** from Spry Inc.—stood head and shoulders above the crowd.

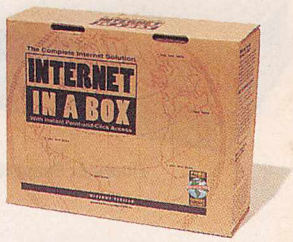
Spry has designed and delivered a product that is clearly meant to be used by real people. AIR Series includes both an easy-to-use installation program and great documentation to get you up and connected painlessly. Once you're on-line, it offers the best suite of tools we have seen yet anywhere for helping you use the Internet productively. Included among the AIR tools is one of our favorite e-mail programs (AIR Mail), our favorite news reader (AIR News), and one of our favorite World-Wide Web browsers (AIR Mosaic), along with a host of other applications and utilities. (Reviewed: October 11, 1994, page 161.)

Shortly after we completed our most recent roundup of Internet-related products, Spry released a hit sequel, **Internet In A Box.** Because it includes many of the same programs that are bundled in the AIR Series (including all those mentioned above), this software package is definitely a bargain hunter's dream. It even comes bundled with a special edition of Ed Krol's classic full of helpful hints, *The Whole Internet User's Guide & Catalog* (O'Reilly & Associates Inc.) in a big brown box for only $149. To get on-line, you can either use your own PPP account or sign up through Internet In A Box for a SprintLink account through InterServ. For those people who need the very best tools to connect to the Internet, Internet In A Box is the box to buy.

▶ Spry Inc., *Seattle, WA; 800-777-9638. (Reviewed: November 22, 1994, page 56.)*

Circle 472 on reader service card

• Internet In A Box



Internet In A Box



AIR Series 3.0



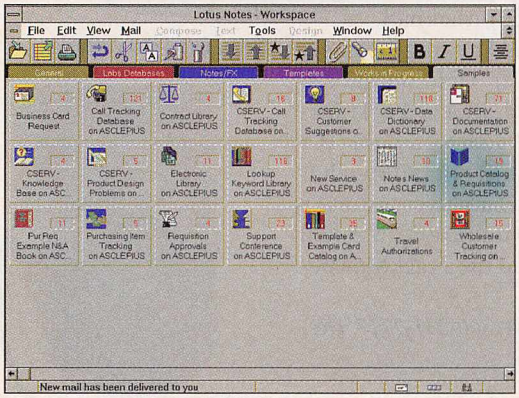
Collabra Share 1.0

GROUPWARE

• Collabra Share 1.0 • Lotus Notes 3.2

BY BEN Z. GOTTESMAN

During the late 1980s, the industry declared *every* year "The Year of the LAN." Recently the annual cry has changed to "The Year of Groupware." Still, you'll wake up soon and realize you're collaborating more than you ever imagined you would.



Lotus Notes 3.2

Collabra Share, Version 1.0 ($69.90 per user for a 10-user license), has an easy-to-use interface for threaded discussions that can run on top of your e-mail system. But its real strength is the ability to integrate non-Collabra users into its forums. Any user of a VIM- or MAPI-compliant mail system can receive messages from a Collabra discussion, respond to messages, and query the message base.

▶ Collabra Software Inc., *Mountain View, CA; 800-474-7427. (Reviewed: November 22, 1994, page 48.)*

Circle 473 on reader service card

You know a product has taken over when the first words out of every competitor's mouth are, "We're better than Product X because. . ." or their last words are, ". . .and it integrates with Product X." In this area, Product X is **Lotus Notes, Release 3.2** ($495 per server; $495 per user). Despite claims by Microsoft and others, no other program provides—nor is likely to provide in the near future—as comprehensive a solution for discussions on as many platforms supporting work forces so diverse.

▶ Lotus Development Corp., *Cambridge, MA; 800-346-1305. (Review: Lotus Notes, Release 3.1.5, December 6, 1994, page NE 1.)*

Circle 474 on reader service card

NETWORKING HARDWARE

• Fibermux SnapLAN • Grand Junction FastSwitch 10/100 AG • Shiva LanRover/E


Fibermux SnapLAN


Grand Junction FastSwitch 10/100 AG



Shiva LanRover/E

BY GAIL SHAFFER AND VICKI JACOBSON

1994 saw lots of network hardware aimed at making the lives of network managers and business travelers a little easier. Many are testimony to the need for more bandwidth and the overwhelming trend toward remote computing.

The dust hadn't even settled on the introduction of stackable wiring hubs when ADC Fibermux and others began reinventing this great new wheel. Stackable hubs offer flexibility, good port density and pricing, and management. The **Fibermux SnapLAN** snap-in, stackable hubs (about $70 per managed Ethernet port) are small, self-contained units that require no bus cables to connect to each other when they are stacked. The SnapLAN line sports support for Ethernet and Token-Ring, SNMP manageability, and routing. They are extremely well priced, easy to install and set up, and modular.

▶ ADC Fibermux Corp., *Chatsworth, CA; 800-342-3768. (Reviewed: September 27, 1994, page NE18.)*

Circle 475 on reader service card

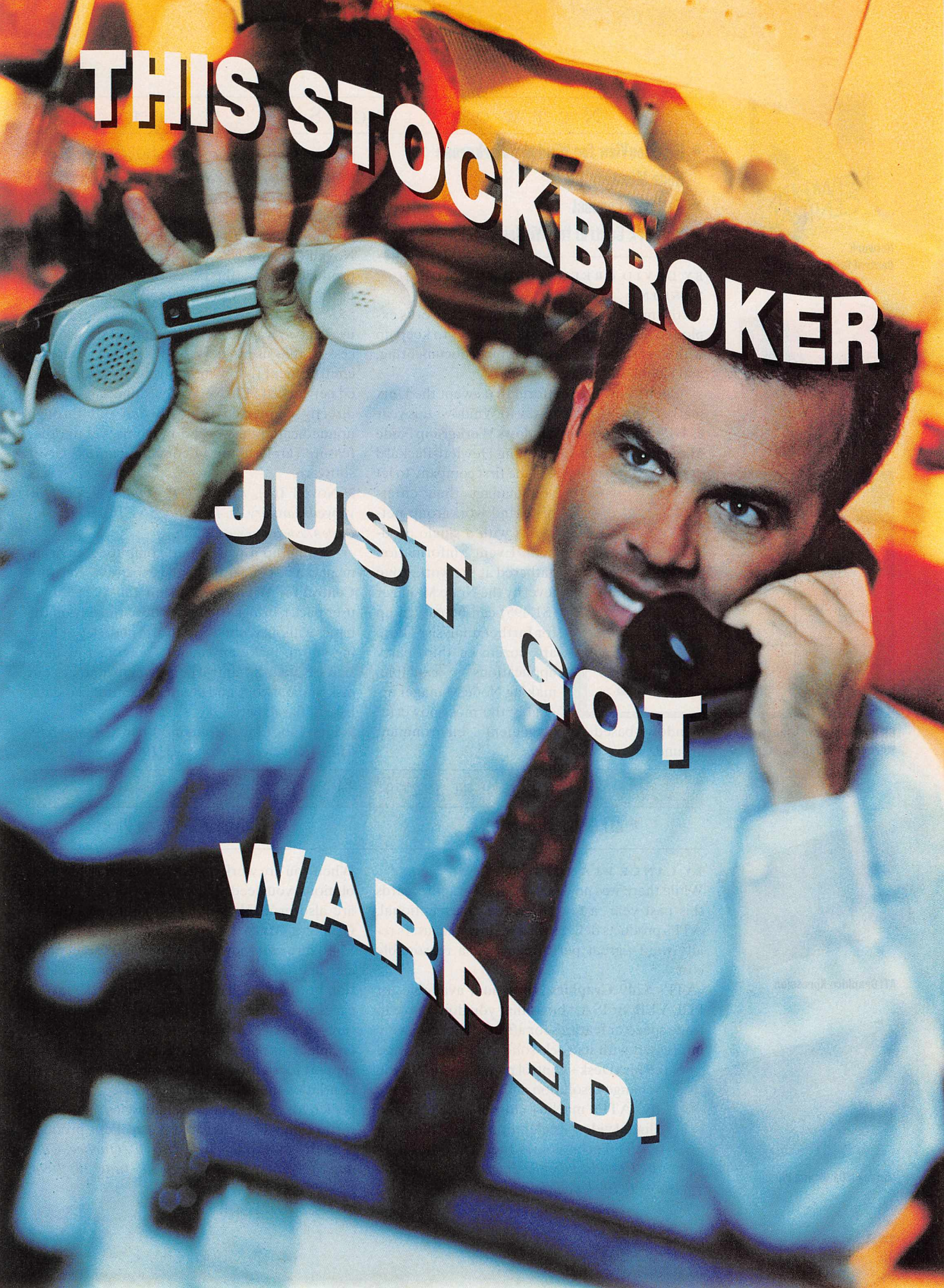
When buyers think of building affordable high-speed workgroups, they think of the **Grand Junction FastSwitch 10/100 AG.** This nifty stackable switch uses a high-speed (100-megabit-per-second Ethernet) pipe where it's needed most—at the server. You don't have to bother upgrading all of those networked PCs; just swap out the Ethernet hub for the FastSwitch. The PCs can continue to use regular Ethernet adapters. The FastSwitch 10/100 AG has 30 ports—25 switched 10-Mbps ports and 5 100-Mbps Fast Ethernet ports—for just under $300 per port. The five 100-Mbps ports constitute one dedicated 100-Mbps port that can be connected to other FastSwitches or a high-speed server and a group of four shared additional ports.

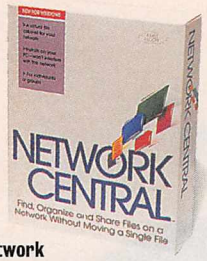
▶ Grand Junction Networks Inc., *Fremont, CA; 800-747-3278. (Reviewed: December 6, 1994, page NE21.)*

Circle 476 on reader service card

Shiva knows remote access. The **Shiva LanRover/E** is a fine turnkey remote-access server that offers good performance and centralized control for multiple remote-node servers. Both the $2,899 4-port and $3,999 8-port LanRover/E cover nearly all remote bases, including dial-in remote-node access, dial-out modem pooling, and dial-up routing. Both versions offer multiprotocol support and can import data directly from the NetWare Bindery.

▶ Shiva Corp., *Burlington, MA; 800-458-3550. (Reviewed: August 1994, page 344.)*


THIS STOCKBROKER
JUST GOT
WARPED.



Network Central for Windows



NetWare Connect

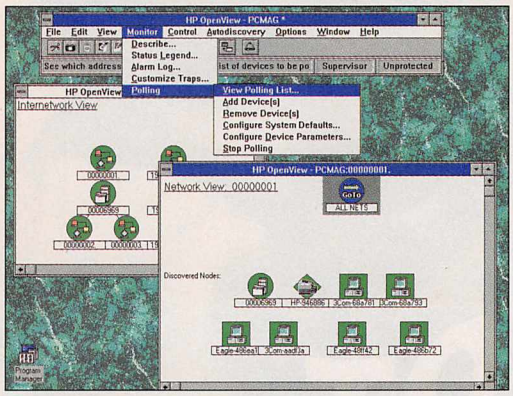
NETWORKING SOFTWARE

- **HP OpenView for Windows Workgroup Node Manager 1.0**
- **NetWare Connect**
- **Network Central for Windows**

BY DAVID GREENFIELD AND ROBIN RASKIN

As the number and combination of networks exploded in 1994, vendors offered ways to keep up with the problems of transforming, documenting, and troubleshooting networks.

OpenView, the platform that swept the Unix market, finally found its way to Windows this year as **HP OpenView for Windows Workgroup Node Manager, Version 1.0,** making Hewlett-Packard Co. the first company to let you manage their enterprise and workgroup networks with a single product. Event information gathered at the workgroup level by the Node Manager ($1,495) can be passed up for further analysis. There are dozens of third-party applications available, making Node Manager arguably the most powerful Windows-based management environment around.



HP OpenView for Windows Workgroup Node Manager 1.0

▶ Hewlett-Packard Co., *Palo Alto, CA; 800-752-0900. (Reviewed: November 8, 1994, page NE15.)*

Circle 478 on reader service card

Network managers needed a way to keep that growing bunch of roving executives connected. Novell's answer was **NetWare Connect,** the first product to serve the needs of remote *and* local users. NetWare Connect ($595 for two ports, $5,995 for 32 ports) lets you connect a traveling user in two ways: as a remote node (allowing access to that user's desktop PC) or as a remote-control client (allowing control of a predesignated networked PC). NetWare Connect also allows directly connected users to dial out through nondedicated networked modems, yet another feature rarely found in communications server software.

▶ Novell Inc., *Provo, UT; 800-638-9273. (Reviewed: January 25, 1994, page NE13.)*

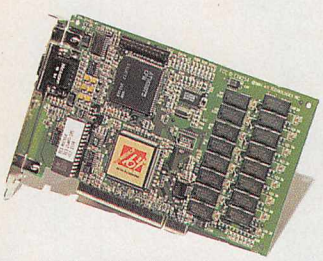
Circle 479 on reader service card

Setting up a workgroup computing environment can be both arduous and expensive. **Network Central for Windows, Version 1.0** ($99.95, two-user pack), brings you up to speed quickly on the basics without costing you an arm and a leg or forcing you to make any major reengineering decisions. Network Central helps you inventory your disk and network and creates a centralized database of file activity.

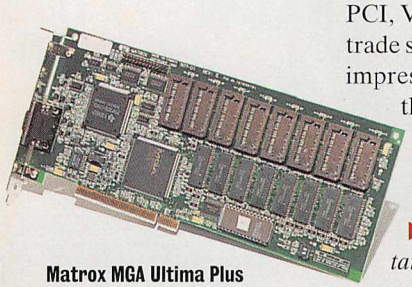
▶ First Floor Inc., *Mountain View, CA; 800-639-6387. (Reviewed: October 25, 1994, page 47.)*

GRAPHICS HARDWARE

- **ATI Graphics Xpression**
- **Matrox MGA Ultima Plus**



ATI Graphics Xpression



Matrox MGA Ultima Plus

BY LANCE ULANOFF

While there was no dearth of solid graphics cards this past year, a few stood out as exceptional. ATI's products deliver what mainstream users really want—great performance at a reasonable cost.

ATI's $249 **Graphics Xpression,** available for PCI, VLB, or ISA, shows that you don't have to trade speed or features for affordability. We were impressed with its rock-solid video drivers and the FlexDesk+ control panel, which lets you change resolution and color depth on the fly. ATI's mach64 chip includes built-in digital video acceleration capabilities.

▶ ATI Technologies Inc., *Thornhill, Ontario, Canada; 905-882-2600. (Reviewed: December 6, 1994, page 250.)*

Circle 481 on reader service card

When you are working in 24-bit color at high resolutions, you need all the speed you can get. You are also probably willing to pay for it. Matrox Graphics' **MGA Ultima Plus** (VLB, $699; PCI, $749) throws its powerful 64-bit MGA accelerator chip and 4MB of VRAM design at your acceleration bottlenecks. The result is one of the fastest cards we have seen. The MGA Ultima Plus features a strong driver suite (including Matrox Graphics' excellent DynaView CAD drivers and support for on-the-fly mode switching) plus a host of utilities and additional drivers. Keep your eyes peeled for new memory technologies that should further enhance this already excellent product.

▶ Matrox Graphics Inc., *Dorval, Quebec, Canada; 800-361-1408. (Reviewed: June 28, 1994, page 216.)*

Circle 482 on reader service card



On a typical day, stockbroker Bret Williams makes his personal computer do some very atypical things.

He imports live market data off the ticker at the same time that he's reading the stock page on-line, at the same time that his computer is firing off e-mail to a client, and at the same time that it's faxing his lunch order (pizza, usually).

He runs his PC without fear of crashing. (If any one of his applications ever goes down, everything else stays up.)

And he gets more out of the software he knows and uses, like Windows™ and DOS.

Bret has OS/2 Warp, the operating system that offers true multitasking, Crash Protection,™ Internet-access – not to mention a BonusPak filled with productivity applications.

The price is also less than you ever thought possible: under $90.

HE'LL DO ANYTHING TO AVOID A CRASH.

Of course, you're welcome to do your own risk assessment.

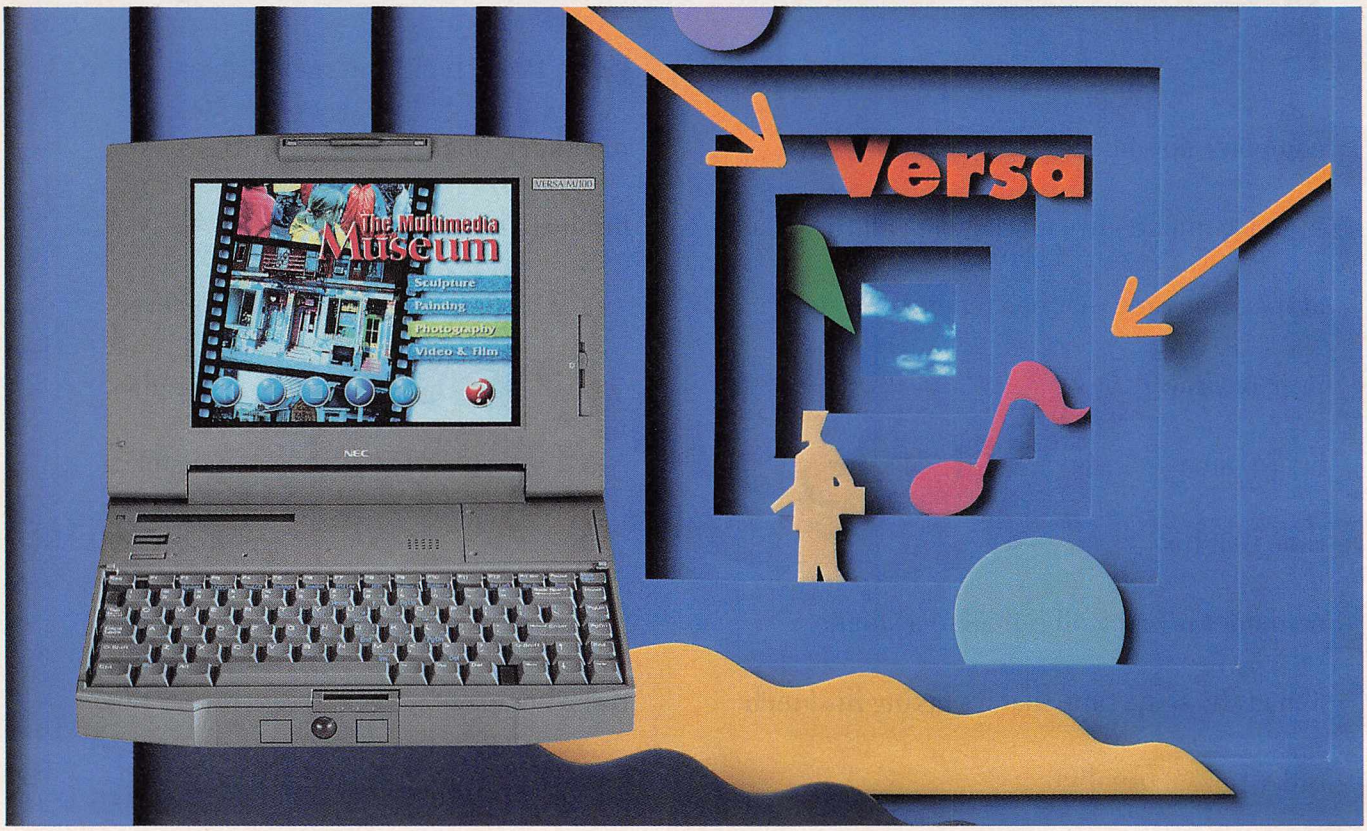
OS/2 Warp is available now. (For stockbrokers and anyone else looking for a great investment.) To get warped, stop by your local software dealer, or call 1 800 3 IBM-OS2. Ask for a free demo disk.

The new 32-bit, multitasking, multimedia, Internet-accessed, crash-protected, Windows-friendly, totally cool way to run your computer. **OS/2® WARP**

IBM®

OS/2 Warp is available from your software dealer. It is also available from IBM for $89 by calling 1 800 3 IBM-OS2.

Reseller prices may vary. OS/2 Warp consists of OS/2 Version 3 and BonusPak. IBM, Operating System/2 and OS/2 are registered trademarks of the International Business Machines Corporation. Crash Protection and the OS/2 logo are trademarks of IBM. Windows is a trademark of Microsoft Corporation.
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NEC VERSA™ NOTEBOOKS: THREE SERIES MEET ALL NEEDS

Notebook computers have become a must for professionals on the go. They now account for a quarter of all PC sales. NEC offers three series of high-quality Versa notebooks that feature unmatched flexibility for upgrades and expansion.

Our top-end Versa M Series is designed for mobile professionals. It combines powerful computing with multimedia capabilities. High-speed processing power is provided by DX4 75MHz or 100MHz CPUs. We offer twelve models with 8MB RAM and up to 810MB of disk storage. Color display options include a 9.5-inch TFT screen with 16 million colors or 800 x 600 resolution. For effective presentations, the Versa M offers 16-bit stereo sound, built-in mike and high-fidelity speakers.

Our Versa V Series offers outstanding notebook performance and TFT color screens at an affordable price. We have four models with DX2 50MHz CPUs, 4MB system memory and up to 340MB of disk storage. The Versa V Series features DoubleTime™ technology with a second battery for 6 to 10 hours of on-the-road computing. Back at the office, the Versa V becomes a full-featured desktop PC with our Docking Station™ II.

The Versa S Series is designed especially for those who need to travel light. Our high-end, 9.5-inch TFT color model with 260MB hard disk weighs only 2.3kg. It measures 276(W) x 212(D) x 42(H)mm. Five models are available with SX 33MHz or DX2 50MHz CPUs, and 4MB RAM.

All trademarks are property of their respective holders.

PROMOTING SDH NETWORKS WORLDWIDE

Network providers around the world are rapidly introducing digital networks based on the Synchronous Digital Hierarchy. NEC offers a comprehensive line of SDH fiber optic transmission systems and microwave radio systems. We are working with network providers in many countries to plan and implement optimum SDH networks.

NEC has started delivery of 155-Mbps SDH microwave radio equipment for the Novosibirsk-Khabarovsk link spanning 4,500km in Russia. The link is part of the grand Europe-to-Far East network connecting Copenhagen, St. Petersburg, Moscow and Khabarovsk. NEC SDH microwave systems will also be used in trunk routes extending 2,000km in Sweden.

Recent orders for our SDH fiber optic transmission systems (FOTS) have come from network providers in Brazil and Mexico, and the national railway of China. Our FOTS will be a nerve center in a trunk line of the projected 2,500km railway between Beijing, China and Kowloon, Hong Kong.

In the US, a leading long-distance carrier has chosen our 2.4Gbps SONET FOTS to connect major American cities. NEC will also supply FOTS and advanced network management systems to a regional Bell company.

P7 OFFERS 40 HOURS OF STANDBY TIME

Our new P7 cellular phone is optimized for business users who demand a whole day's service and don't want to carry spare batteries around.

The P7 offers 40 hours of standby and 135 minutes of talk time with a standard battery. It gives users an extra margin of security and eliminates power problems around the clock.

The P7 offers all the essential functions of a high-end cellular phone. It fits snugly in your palm and weighs only 250g. It's easy to use. It has a 40-character, 4-line LCD screen. Both the display and key pads are illuminated for nighttime use.

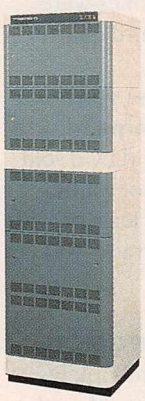
Speech is loud and clear. The P7 has a microphone which filters out peripheral noise and a concave earpiece that lets you hear the caller, not the passing traffic. A retractable, flexible antenna ensures excellent reception.



You can easily convert the P7 to a car phone with optional car kits. They include a cigarette-lighter adapter, a hands-free kit and a 3W booster.

SMART, COST-EFFECTIVE PABX

The NEAX7400 ICS* series is a new generation of PABX systems for voice and data. It features a unique architecture – distributed access to a cluster of telephones.



Conventional PABX systems make direct access to each telephone they serve. This requires as many connecting cables as telephone sets. NEC's new system uses only two pair cables. They carry 2Mbps of multiplexed data for connection with a Distributed Access Unit. The DAU provides information for up to 30 telephones.

Distributed access greatly reduces cabling costs and duct-space requirements. Users can add or move telephones with unprecedented ease. The DAU system offers an efficient response to the needs of work groups by connecting clusters of analog or digital telephones.

Our new PABX systems come in a variety of modular, upgradeable models supporting up to 23,552 ports. All offer over 500 service features, including integration with computers and access to ISDN.

*Names/specs vary in Brazil and the USA.

NEC

CIRCLE 153 ON READER SERVICE CARD

Jim Seymour's Thumbs Up, Thumbs Down

In which our critical columnist casts his eye on the escapades and machinations of the year gone by.



Thumbs up to **IBM** for finally shipping a fully-featured version of OS/2 in Warp, Version 3. Looks like all those bad jokes about IBM PC software will finally have to be retired.



Thumbs down to **IBM** for shipping OS/2 Warp with a terrible installation routine. If you can get it running, you may like it but we'll bet a significant number of Warp buyers turn it into shelfware because they can't get it installed correctly. Looks like all those bad jokes about IBM PC software just came back to life.



Thumbs down to **Microsoft** for This Year's Delays in getting Windows Chicago/Windows 4/Windows95/WindowsSomeday out the door. Gee, wonder what 1995's excuses will be?



Thumbs up to **sound card vendors,** who made their products somewhat easier to install. Now you're about a fourth of the way there, folks.



Thumbs down to the **advertising geniuses** who came up with this year's crop of gross PC ads. In a business with a rich tradition of focusing on severed limbs, leaky diapers, and computer displays providing urine samples, Gateway's agency broke new ground by focusing on body odors. What's next? WAIT!—on second thought, we don't want to know.



Thumbs up to IBM's chief **Lou Gerstner**. Last year he put his foot in IBM's mouth with a remark about not caring much for "the vision thing." But this year he cranked out real profits, real products, and a very real increase in the stock price.



Thumbs down to all those purveyors of **"500-Channel Future"** hype, who even in their own controlled test markets, and at highly subsidized rates, can't interest Bill and Sally C. Potato in their barely interactive offerings.



Thumbs up to **Compaq** for bold step to build a viable multi-source x86 chip market by dancing with the wolves, AMD and Next Gen, at Intel's door.



Thumbs down to **Compaq** for foolishly and petulantly ignoring for so long the enormous demand for Pentium PCs in the home market. A great year could have been even better, and the Presario line wouldn't have had to surrender turf to the likes of Packard-Bell. (Hmm. Could Compaq's delays in moving into Pentium-based home PCs have had just a teeny bit to do with the $2.8 billion in 486-based PC inventory that Compaq still had stashed in its warehouses at the end of the third quarter?)



Thumbs up to those **vendors of V.Fast modems** who, knowing all along they'd sold their customers short by not waiting for real V.34 standards, at least provided cheap flash or chip upgrades to The Real Thing this fall.



Thumbs down to **PCMCIA vendors** and notebook PC vendors for foisting off on the public a mountain of almost compatible PCMCIA slots and cards.



Thumbs up to all of those **PCMCIA vendors,** who finally dropped the worst acronym in the history of computing—did it really mean "People Can't reMember Computer-Industry Acronyms"?—for CardBus, which is what the standard should have been, and could have been called, all along.



Thumbs up to the makers of the new, and new-looking, **pointing devices** which flooded the market this year. We're not sure we want tiger-striped mice on our desks, but the range of choices today is wonderful, accommodating hands of all sizes and ages as well as different styles of working.



Thumbs up to **Microsoft** for swallowing its pride and swallowing Intuit. Microsoft Money was a wallflower that was going nowhere. Selling it to Novell and pony-ing up a rumored billion and a half for the maker of Quicken was a smart, if sobering, move for Gates & Co.



Thumbs up to **Hewlett-Packard** for bringing the 11- by 17-inch laser-printer market to life with its hot HP LaserJet 4MV tabloid-size printer late in the year—at about half the price of similar tab-size machines.



Thumbs up to those regional telephone companies, especially **Pacific Bell,** which have aggressively promoted and priced their Integrated Services Digital Network service.



Thumbs up to **AT&T** for finally having the good sense to kill off its Eo product, which was clearly either The World's Largest PDA or The World's Smallest Coffee Table.

GRAPHICS SOFTWARE

- **Astound for Windows 1.5**
- **Hijaak Graphics Suite 3.0**
- **Kai's Power Tools 2.0 for Windows**
- **Lotus ScreenCam 1.1**
- **Quark XPress for Windows 3.3**

BY LANCE ULANOFF

This past year, we saw presentation graphics tools headed toward offering sound, video, *and* animation; utilities that were more robust and complete than ever; and the gradual blurring of the line between image editing and 24-bit paint, resulting in a brand-new hybrid called photo illustration. We also saw new ways to demo software and high-end PC publishing tools that finally surpass the abilities of mainframe-based systems.

Astound for Windows, Version 1.5, is what multimedia presentation packages should be all about. This $399 package has some really great boilerplate effects and tons of tools that make them all easy to use. Astound marries eye-catching transitions, special effects, and animation capabilities with more traditional tools in a way that proves that the words *multimedia* and *presentation* really do belong in the same sentence.

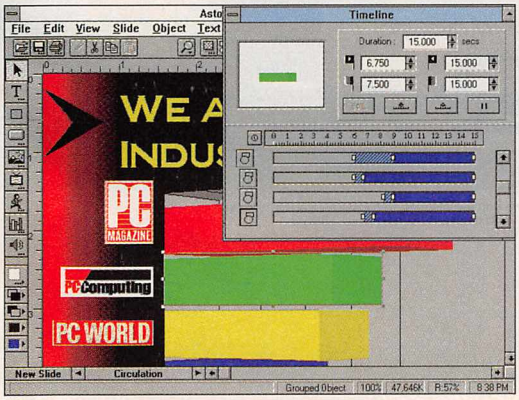
▶ Gold Disk Inc., *Santa Clara, CA; 800-982-9888. (Reviewed: September 27, 1994, page 264.)*

Circle 483 on reader service card

The search for the perfect grab bag of graphics utilities is never-ending, but for $99 (street price), the **HiJaak Graphics Suite, Version 3.0,** offers the closest thing to one-stop shopping on the market. Recognized as a powerful image-conversion tool, HiJaak PRO 2.0 featured a rich set of file filters. The latest release includes support for AI Postscript, CDR, EPS, and WPG2. But Inset Systems has made it a full-fledged suite by including a well-endowed drawing package, HiJaak Draw (an upgraded version of Gold Disk Professional Draw), and image-management features including HiJaak Smuggler, which uses the Windows Clipboard to give image conversion and import capabilities to other applications.

▶ Inset Systems Inc., *Brookfield, CT; 800-374-6738. (Reviewed: October 25, 1994, page 71.)*

Circle 484 on reader service card



Astound for Windows 1.5

Most capable image-editing products offer a healthy number of image filters and effects, but they're often hard to use or offer few customization options. Enter **Kai's Power Tools 2.0 for Windows** ($199 list). Its combination of powerful, intuitive interfaces like the Fractal Explorer and Gradient Designer and more strangely named filter presets than you can shake a stick at—check out Neural Nervous and Blues Nightlight Sweep—gives you unparalleled power over your images. Add to this its seamless integration with host products supporting the Adobe plug-in architecture and the instant gratification of visual feedback, and you've got *the* power tool for serious photo illustrators.

▶ HSC Software Corp., *Carpinteria, CA; 805-566-6200. (Reviewed: December 20, 1994, pages 40 and 138.)*

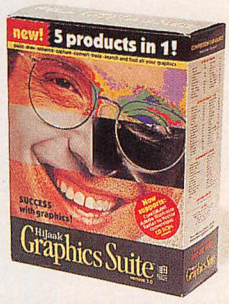
Circle 485 on reader service card

It's tough when vendors try to tell us over the phone what their software looks like and what it does. Lately, they've been taking a more successful tack: sending a floppy disk with a great demo created using Lotus Development Corp.'s $79 **Lotus ScreenCam, Release 1.1.** By using innovative technology that records screen updates rather than individual frames, ScreenCam can record the on-screen action of any Windows-based software. If you have a microphone, you can even add your own narrative soundtrack. We were so impressed, we used ScreenCam to create most of the software demos on the PC Magazine CD.

▶ Lotus Development Corp., *Cambridge, MA; 800-343-5414. (Reviewed: July 1994, page 56.)*

Circle 486 on reader service card

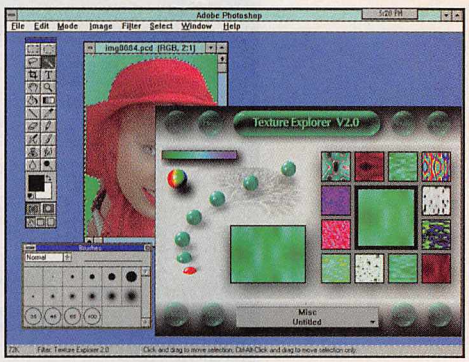
QuarkXPress for Windows, Version 3.3, disproves the old adage that if you're late out of the gate, you're out of the race. While Quark was far from the



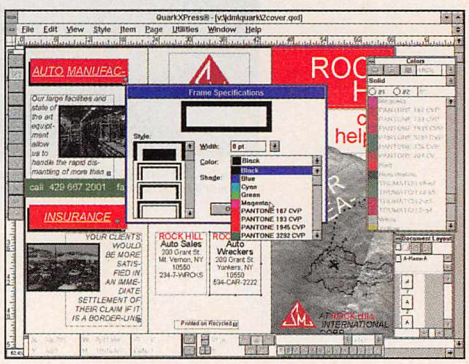
HiJaak Graphics Suite 3.0



Lotus ScreenCam 1.1



Kai's Power Tools 2.0 for Windows



Quark XPress for Windows 3.3



*In Canada, call 1-800-387-3867, Ext. 8573. You may also obtain information through the Internet at URL location: http://www.hp.com/DMO/PERIPHERALS/peripherals_main.html
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In color. In no time.

The speedy new HP Color LaserJet.

You've already taken the first step into color printing. And it's really made a difference in your users' work. But as demand for color has grown, you've noticed that what they need is more speed.

Now, with Hewlett-Packard's latest innovation, you can take the next step. The new Color LaserJet printer. It keeps pace with the workload by delivering up to 2 sharp, colorful pages every minute. Or 10 black & white pages. Now, multiple copies of reports and proposals can easily be done in color. Merged text and graphics documents are laser sharp. On plain paper. And printed permanently.

To make color easier to use, the Color LaserJet offers ColorSmart. For compatibility, there's enhanced HP PCL 5 and optional genuine Adobe™ PostScript™ Level 2 software. Add an optional industry-leading HP JetDirect card and you've got a color laser printer that works seamlessly on virtually any network.

As you'd expect, this move up to laser color comes with HP's renowned commitment to service and support. For more information or a sample from the fast new Color LaserJet, call 1-800-821-8440, Ext. 8573.*

You do your job. We'll do ours.

HP LaserJet Printers

HEWLETT® PACKARD

first serious desktop publishing package to appear, it is now virtually unchallenged as the choice for professional work. This year saw the release of the $895 Version 3.3. The big news is Quark Inc.'s EfiColor XTension, which lets you map the colors of your specific hardware to the device-independent CIE LAB color model. This lets you produce consistent color across hardware devices and four-color separations from RGB images. Other QuarkXTensions, produced by the company or the sizeable army of third-party Quark developers, can considerably extend the product's ability to handle long, complex documents.

▶ Quark Inc., *Denver, CO; 800-788-7835. (Reviewed: May 17, 1994, page 186.)*

Circle 487 on reader service card

PERSONAL INFORMATION MANAGERS

• ECCO Professional 2.0



ECCO Professional 2.0

BY TED STEVENSON

Personal information managers (PIMs) have evolved from command lines to GUIs and have diverged wildly in the ways in which they organize information.

ECCO Professional, Version 2.0, begins where other PIMs leave off: Its bedrock contact-management tools are competent and easy to use. Its outline metaphor provides a stream-of-consciousness record of your workday that can be effortlessly diced, spliced, replicated, and otherwise organized. Version 2.0 allows e-mail and scheduling among ECCO users and Microsoft Schedule+ users. Road warriors can easily synchronize their ECCO database with their desktop or LAN database via direct LAN connection, e-mail, or modem.

▶ NetManage Inc., *Bellevue, WA; 800-457-4243. (Reviewed: June 14, 1994, page 56.)*

Circle 488 on reader service card

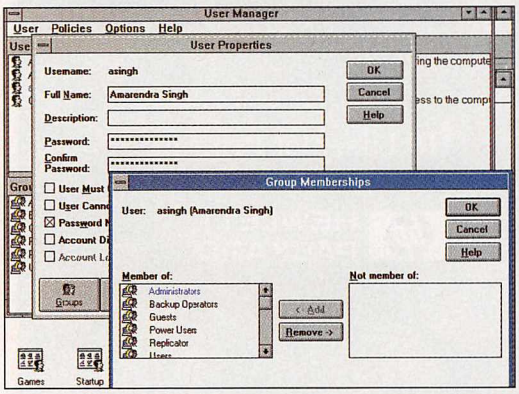
OPERATING SYSTEMS

• Microsoft Windows NT Workstation 3.5

• OS/2 Warp 3

BY DON WILLMOTT

1994 is also destined to be remembered as the year when Windows 95 didn't ship. Nevertheless, all was far from quiet in the world of operating systems: Late in the year, two impressive new 32-bit environments made news.



Microsoft Windows NT Workstation 3.5

Unlike Microsoft Windows 95, the $319 **Microsoft Windows NT Workstation, Version 3.5,** still looks much like Windows 3.1. Under the surface, however, it's a very different animal. With Windows NT Workstation, you'll find built-in networking features; crash protection for 16-bit apps; and support for full 16- and 32-bit OLE 2.0 and symmetric multiprocessing. This demands high-end hardware (don't even think about using it unless you have a 66-MHz 486 and 16MB of RAM). But you shouldn't be scared off by its power. Many of Windows NT Workstation's best new features are hints of things to come, and it's a future you can see today.

▶ Microsoft Corp., *Redmond, WA; 800-426-9400. (Reviewed: December 20, 1994, pages 120 and 221.)*

Circle 489 on reader service card

IBM's **OS/2 Warp, Version 3,** is the first OS/2 that's really built for end users. It's object-oriented, relatively easy to learn, and packed with a bundle of 32-bit applications, including Internet tools, that work as smoothly as any we've seen. This $129 software is an outstanding platform for running DOS games. Furthermore, OS/2 Warp can run in 4MB of RAM (though we recommend 8MB or even 16MB for optimal performance), and this feature may help it find a home on notebook PCs and home PCs. IBM's biggest challenge now is getting software developers to write mainstream native-OS/2 applications.

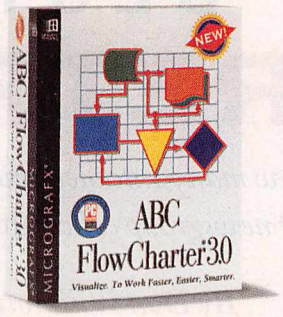
▶ IBM Corp., *White Plains, NY; 800-342-6672. (Reviewed: December 20, 1994, page 221.)*

Circle 490 on reader service card



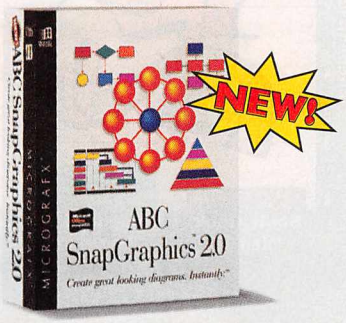
OS/2 Warp 3

Best Selling.



ABC FlowCharter® 3.0, the best-selling Windows™ flowcharting software.

Best Looking.



ABC SnapGraphics™ 2.0, to create great-looking diagrams instantly.

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CIRCLE 361 ON READER SERVICE CARD

THE BEST OF ABORT, RETRY, FAIL?

As 1994 ends, we pause and wonder: How many Internet newbies does it take to screw in a light bulb? Maybe someone will start an Internet newsgroup called alt.joke.light.bulb *and post an answer.*

By Don Willmott

THE 1994 ARF AWARDS



CHEESIEST CELEBRITY ENDORSEMENT

In May, Tony Bennett explained why he was the logical spokesman for WordPerfect. "It's a natural stretch for me. I search for the perfect rhyme. That's what my bag is. Getting the words perfect."

BEST OPENING PARAGRAPH FROM A PRESS RELEASE

"They're back! They're British! And they're bonkers! They're bombarding your basically blasé computer with a bewildering barrage of bad burlesque bedlam and blushingly blasphemous and barmy behavior, boldly banishing banality and boredom! Reviewers are going starkers over the new interactive multimedia CD-ROM thingy 'Monty Python's Complete Waste of Time' calling it 'a must for loonies; and 'an inexcusable waste of human ingenuity.'"

BEST TYPO OF THE YEAR



MOST INTIMIDATING BUZZWORD

In September, Novell announced that its strategy for the future was going to revolve around the concept of "pervasive computing."

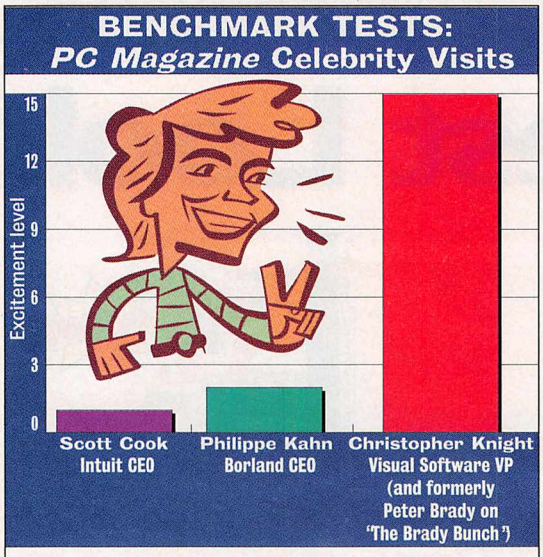


BEST NEW VIRTUAL VACATION SPOT

First there was Silicon Valley. Then came Multimedia Gulch. Now there's Siliwood, the virtual place somewhere between Hollywood and Silicon Valley where products like Fabio Screensaver and Heart: 20 Years of Rock and Roll are brought into being.

BEST ACCUSATION OF FALSE IMPRISONMENT

In May, Seattle television reporter Scott Rensberger sued Microsoft CEO Bill Gates for false imprisonment. He was allegedly arrested by private security guards for trespassing at



This graph shows the relative excitement levels generated by visits of PC-industry luminaries to *PC Magazine* in 1994.

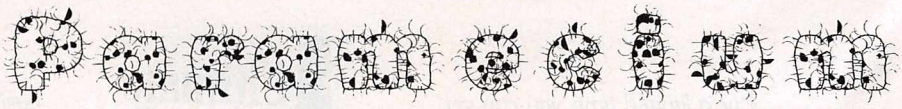
Play It Safe with Intel. . .

This. . .uh. . .thing was spotted (inevitably perhaps) hanging off the parking garage at the Sahara Hotel in Las Vegas.



Greetings from Font Hell

The good news: In 1994 you could buy several great new packages like Font-o-matic to design your own fonts. The bad news: You could design fonts like this nightmare from the twisted mind of *PC Magazine* contributor Lori Grunin.

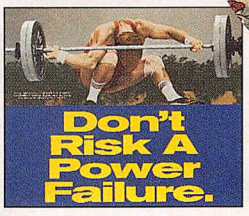


Be Careful Out There

Since when did shopping for computer products become a potentially deadly experience? Maybe this collection of ads from 1994 is revealing our collective existential angst. Maybe not.



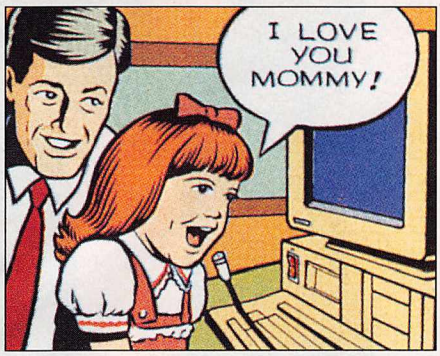
Uggggggh!



Ooooooof!

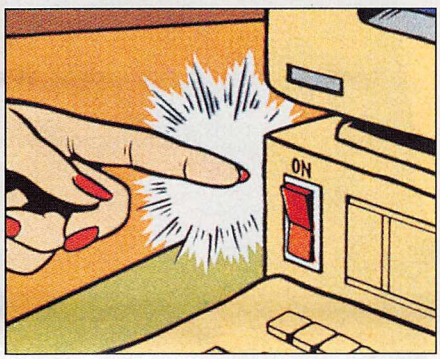


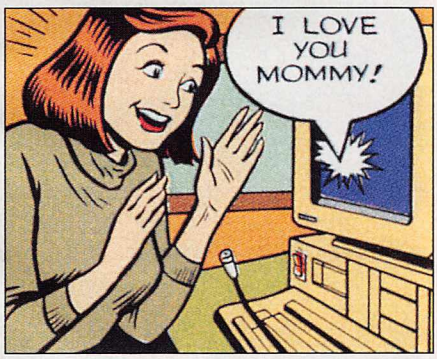
Eeeeeeyikes!



. . .And Play It Loud with Microsoft

Here's Microsoft's cutesy-poo explanation of why sound is an essential Windows feature.



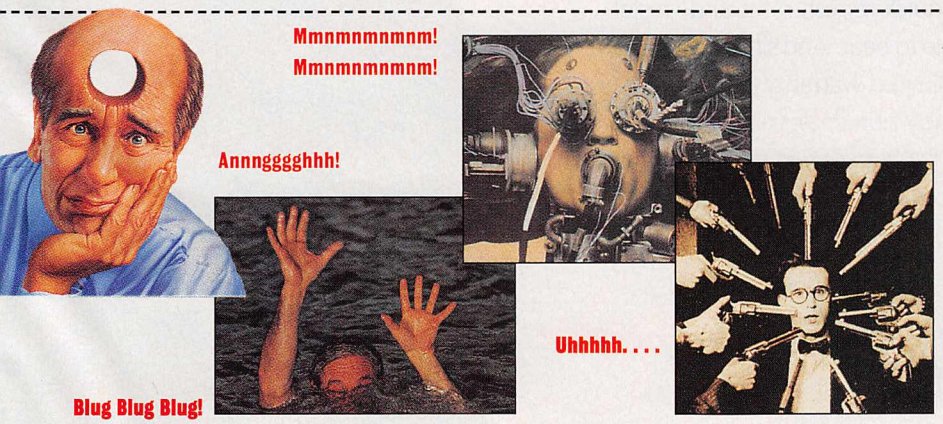


Missed It This Year, But We'll Definitely Be There Next Year



20 Newsgroups You Can Actually Visit on the Internet

- *alt.adjective.noun.verb.verb.verb*
- *alt.alien.visitors*
- *alt.american.olympian.choke.choke.choke*
- *alt.bad.clams*
- *alt.barney.dinosaur.die.die.die*
- *alt.bigfoot*
- *alt.binaries.pictures.furry*
- *alt.binaries.sounds-armpit.noises*
- *alt.bitterness*
- *alt.bob-packwood.tongue.tongue.tongue*
- *alt.butt.harp*
- *alt.cows.moo.moo.moo*
- *alt.devilbunnies*
- *alt.fan.debbie.gibson*
- *alt.pantyhose*
- *alt.religion.wombat*
- *alt.sex.boredom*
- *alt.spank.tonya.harding*
- *alt.timewasters*
- *alt.tv.90210.sucks.sucks.sucks*



Gates's New Year's Day wedding in Hawaii.

MOST MALADROIT COMPANY CLOSING

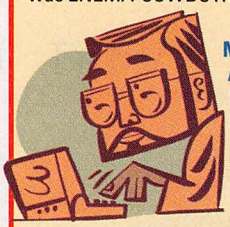
In August, IBM shut down its Ambra PC division—but in September Ambra ads were still running, and the headline said: "Before you buy a computer, we'd like to sell you a company."

MOST BAFFLING LEAD SENTENCE IN A COMPUTER REVIEW

"At this moment, I feel like a bizarre hybrid of Keanu Reeves and Alexander Graham Bell."—Don Steinberg in *GQ*, describing the Compaq Contura Aero.

MOST UNFORTUNATE PREASSIGNED PASSWORD

Imagine one *PC Magazine* reader's dismay when he discovered that the America Online password he'd been automatically assigned was ENEMA-COWBOY.



MOST EFFECTIVE ACCIDENTAL PRODUCT PLACEMENT

If you looked closely at the notebook PC on Judge Lance Ito's bench during O.J. Simpson's pretrial hearings (and if you could read upside down), you found out that when the judge computes, he computes with a Toshiba Satellite. In a related development, F. Lee Bailey, defense attorney to the stars, revealed that he likes the Canon NoteJet's built-in printer.

WORST ACRONYM FOR AN INTANGIBLE MARKETING CONCEPT

OOBE (rhymes with *newbie*): Out of box experience. The fear, torment, and anguish that you feel in the first few hours you spend with your new home PC. Quantifiable by the number of cuss words you use per hour (keep the kids at a safe distance).

CUTEST JOKE ABOUT SOFTWARE BLOAT

You think Microsoft Office is big now? Just wait. The next version is going to be called Microsoft Office Park!

MOST ANATOMICAL-SOUNDING NEW PRODUCT NAME

AT&T's Vistium is a videoconferencing product, so why does it conjure up images of obscure, infection-prone body parts? ("Well, Mr. Smith, the tests show a slight inflammation of your vistium. We'll have to perform a vistiostomy.")

MOST MEGALOMANIACAL INFO HIGHWAY VISION

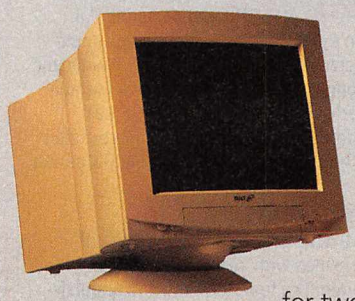


In October, upper-crust lifestyle guru Martha Stewart described her on-line plans to *The New York Times:* "Everything I'm trying to develop now is geared toward the ultimate Internet for Martha."

Winners this issue: John Duke, Thomas Gerber, Stewart Johnson, Sven Sjödin, and John Sponauer.

WHAT HAPPENS WHEN YOU ADD SIZE TO AN ALREADY EXTRAORDINARY PACKAGE?

WHAT DO YOU THINK?



At 7 feet 2 inches tall, Kareem Abdul-Jabbar has got some serious size. But that's only half the story. The fact that he added superior basketball skills to an already imposing frame is what made him a dominant force in the NBA for two solid decades.

The new ergonomically and aesthetically designed Elite series of monitors from MAG InnoVision have features that other monitors just can't touch. And the fact that they only come in the larger 15-inch, 17-inch and 21-inch sizes with the most advanced CRT technologies makes them truly fantastic. Advance Display Calibration, Green Energy and LCD displays combined with ultra high resolutions up to 1600 x 1280, lightening-quick refresh rates and crystal clear dot pitches make them impossible to beat. And since they're so reliable, we'll even throw in a 3-year limited warranty.

So pick one up at a MAG InnoVision dealer near you. Their larger size and imposing features are liable to dominate the market for years to come and they cost a lot less than, say, an NBA draft pick these days.

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CIRCLE 067 ON READER SERVICE CARD

Making The Grade

Our latest Service and Reliability survey reveals what readers think of the top PC, printer, and monitor vendors.

By Bill Howard



In the PC industry, if you build it, they will come—but they may only window-shop. If you want to sell to and hold onto customers, you have to do more. You have to build the products right, and then you have to support them right.

Reliability, service, and support do wonders to distinguish system vendors. So at *PC Magazine* we repeatedly poll subscribers to find out how satisfied they are with their PCs, portables, monitors, and printers: twice a year for desktop and portable PCs, once a year for monitors and printers.

The most satisfying vendors from our Service and Reliability surveys receive Readers' Choice awards. They are vendors that subscribers rate above average on the three key measures on our survey: satisfaction with reliability, satisfaction with repair experience, and satisfaction with technical support. The 18 recipients of Readers' Choice awards are:

- **Desktop PCs** (9): Compaq, Dell, Digital, Gateway, Hewlett-Packard, IBM, Micron, Northgate, and ZEOS.
- **Notebook PCs** (6): Apple, Compaq, Gateway, Hewlett-Packard, IBM, and Texas Instruments.
- **Monitors** (2): NEC and Sony.
- **Printers** (1): Hewlett-Packard.

HOW WE SURVEYED

While computer equipment has a long way to go before it's considered commodity hardware, users clearly do perceive some similarity of performance, and often of price, among competing brands. That's why the issues of reliability and service take on such importance. It's also why you see so many people asking survey questions on this subject. A number of computer magazines conduct surveys in addition to *PC Magazine*. Even J.D. Power & Associates, of automobile-polling fame, conducts its own survey.

How We Surveyed

In August 1994, we mailed questionnaires to two randomly selected samples of *PC Magazine* subscribers. The 17,000 subscribers in our first sample received a questionnaire that focused on desktop and notebook PCs, while the 7,500 subscribers in our other sample received a questionnaire that focused on printers and monitors.

Here's what you should know about *PC Magazine*'s Service and Reliability surveys and why we think they're useful.

This is the fifth such poll conducted since early 1993 with essentially the same methodology and survey questions. That means you can see how a vendor has fared over time, or whether a vendor is on an upward or downward slope.

Most important, we *mail* surveys to subscribers. These subscribers are randomly chosen. Last August, surveys were mailed to 17,000 *PC Magazine* subscribers for the desktop and notebook PC survey and to 7,500 subscribers for the monitor and printer survey. While it costs more to do a large mail-based survey, we strongly believe that we get better, more valid results. Each survey has achieved at least a 50 percent response rate, and the results are analyzed using a scientific test of significance. These measures ensure that there is no respondent duplication and no vendor participation, and that any assessment of vendor ratings gleaned from the data gathered is objective.

Both surveys were closed for tabulation on September 26, by which time we had received a 50 percent response for each. The desktop and notebook data in this report is based on the responses in the 8,455 returned, usable questionnaires (the post office returned 262 questionnaires as undeliverable); printer and monitor data is based on the responses in the 3,731 returned, usable questionnaires (116 questionnaires were returned by the post office). Willard & Shullman, a research firm based in Greenwich, Connecticut, tabulated all survey results.

In the desktop/notebook questionnaire, we asked subscribers to describe up to five desktop and laptop or notebook PCs they used over the past two years, telling us the manufacturer and chip type of each. The printer/monitor questionnaire asked subscribers to describe up to five printers and monitors they used over the past two years, telling us the speed and type of printer and the resolution and size of each monitor. Next, on a scale of 1 (lowest) to 10 (highest), respondents rated their satisfaction with the reliability of each PC, printer, or monitor, and their satisfaction with repair experiences and the technical support they received. Respondents also rated their satisfaction with specific types of technical support they may have

GENERAL SATISFACTION

What we found is a generally high level of satisfaction with all types of hardware. On a scale of 1 (lowest) to 10 (highest), the average score on each of our key survey questions is typically in the range of 7 to 8. We asked subscribers to tell us about the desktop PC, notebook, monitor, or printer used most often, and about one to four other units used in the past two years. (For more information on survey methodology, see "How We Surveyed.") Here are the four questions we asked, and what we found:

Overall Scores

	Reliability	Repair	Tech support	Buy again?
Desktop PCs	7.8	7.3	7.0	5.9
Notebook PCs	7.8	6.9	7.0	6.4
Monitors	8.5	7.2	7.2	7.2
Printers	8.1	7.4	7.4	6.9

Higher scores represent greater customer satisfaction.

• **Satisfaction with reliability.** Of the four questions, this one has received the most positive subscriber response, with average scores for each product category ranging from 7.8 to 8.5.

Monitors have the strongest average reliability score, PCs and portables the poorest—which is about what you'd expect: Unless you spill coffee on them, most monitors and printers work right out of the box and keep on working.

This is one question we modified slightly from previous surveys. In the past, we asked subscribers to rate "overall reliability" directly. This time we asked subscribers to rate "satisfaction with overall reliability." Perhaps as a result, the scores are not quite as high as they were a year ago, when they ranged from 8.2 to 8.8.

• **Satisfaction with repair experience.** The average scores here range from a low of 6.9 for notebooks to a high of 7.4 for printers. Because portables get jostled around so much, they're more likely to break than monitors or printers, and even the most positive repair experience isn't likely to be as satisfying as no repair experience at all.

• **Satisfaction with technical support.** The scores here are almost the same as the repair experience scores. The one exception is for desktops, in which case the average tech-support score is a bit lower than the repair-experience score.

• **Future likelihood of buying** (from the same vendor). As in the past, average scores here tend to be lower than for the other three questions, ranging from 5.9 for desktops to 7.2 for monitors.

We also found that while responses to the other three questions correlate among themselves—if you like Compaq's reliability, for example, you also probably like its repair service and tech support—the same doesn't always hold for whether you'd buy a product from the same vendor in the future. While the buy-again question reflects satisfaction with the other three key measures, we believe buyers also factor in whether the unit seems fairly priced compared with the competition, and whether the vendor is on shaky grounds financially. Northgate—a Readers' Choice winner in the PC category, but also a company that has recently suffered financially—has a below-average "future likelihood of buying" score.

READERS' CHOICE GRADES

In assessing the vendors, we assigned grades of A, B, C, D, or E based on whether vendors' scores are above average, average, or below average for the three key measures. Likelihood to buy in

received, including toll-free technical support (800 numbers), free technical support (non-800 numbers), written documentation, and vendor support via bulletin boards. The desktop/notebook questionnaire also asked respondents to rate their satisfaction with remote diagnostics via modem. Each survey also asked respondents to rate their future likelihood of buying a new desktop PC, notebook PC, printer, or monitor from each vendor.

MAKING SENSE OF THE RESPONSES

To analyze the results, we focused on one measure (survey question) at a time and calculated an average (mean) score for each PC, printer, and monitor vendor. Only vendors that received at least 50 responses (in our opinion, the minimum amount of data required to produce statistically reliable results) were included in the final tabulations. As a standard of comparison, we calculated an overall average for each measure by adding the individual manufacturer averages and dividing by the number of manufacturers rated. Thus, we were able to obtain an average score that was not weighted by market share; each vendor contributed equally.

STATISTICAL METHODOLOGY

The differences cited in this report were evaluated using a standard t-test of means. Such a test considers the following components: the scores, the amount of dispersion among the scores, and the sample sizes. T-tests tell us whether or not the difference between two scores is large enough to be considered statistically significant at the 95 percent confidence level. This means that if we were to conduct this study in exactly the same manner 100 times, we could expect the differences reported here to occur at least 95 times. This provides a high degree of confidence that the differences are not due to chance or error.

T-tests can sometimes produce anomalous results where two scores that appear close together may in fact be significantly different from one another. T-tests can also reveal no significant statistical differences between two scores that seem far apart from one another. It is also possible for one vendor to appear in the average range while another with the same score emerges as significantly above average. These results are a function of the objective, evaluative components of a t-test of means.

the future is not used in determining the overall grade.

- **A.** The vendor is above average on all three key measures: satisfaction with reliability, and satisfaction with repair service, satisfaction with technical support. Such vendors are the Readers' Choice award recipients.
- **B.** The vendor has a combination of above-average and average scores only—no below-average scores.
- **C.** All three scores are average. C could also indicate a vendor that had one of each kind of score—above average, average, and below average—but none of the vendors has that combination.
- **D.** The vendor has a combination of average and below-average scores—no above-average scores.
- **E.** The vendor is below average on all three key measures. This doesn't mean the vendor is hopeless. Rather, it says that in a field where satisfaction levels are generally high, the vendor's scores aren't quite as high as those posted by the competition.

WHY 8.2 IS NOT THE SAME AS 8.2

For the full statistical methodology, see the sidebar above, "How We Surveyed." But there are two points we want to emphasize here. The first is that above average or below average means just that: Statistically, the score is significantly above or below the average. But "average" can mean we're confident it's average, or it can mean a double negative: We're not confident it's not average.

And that leads to the second point: Identical numeric scores could lead to different rankings. For instance, among desktop PC vendors, five have reliability scores of 8.2, and the average desktop PC reliability score is 7.8. But only three of the five are statistically above average; the other two are in the average range, meaning that there is not enough clear data to elevate them into the above-average tier. The most common causes are a small number of responses and/or scattered responses, meaning that responses aren't tightly clumped in the vicinity of the vendor's average score.

OTHER INFORMATION

Our surveys also asked for information about the CPU inside the system, or the size of the monitor, and some information about the user's background and where he or she works. Not at all surprisingly, we find greater levels of satisfaction with reliability among systems with contemporary CPUs (486 or Pentium) than among 386 and earlier PCs.

For this survey we also inquired about the types of technical support used recently (in the past six months). Regardless of category and type of technical support, no more than six of ten respondents are "highly satisfied" with the support they received. Toll-free technical support, however, is consistently the type of technical support that the largest proportion of respondents is highly satisfied with.

ABOUT THE STORY

This story is divided into four sections: this overall introduction with a methodology sidebar, desktop and notebook PCs, monitors, and printers. Within each of the following sections, you'll find these descriptive tables:

- The Readers' Report Card grades and up-or-down indicators showing whether each vendor has moved up or down since the last survey.
- A breakdown of the four survey questions—reliability, repair, tech support, buy-again—showing decimal scores on the 1-to-10 scale, color-coded to indicate whether each score is above average, average, or below average.
- In the PC and notebook sections, historical data going back to 1993 to show how readers graded each vendor in the past. This lets you see how a vendor is doing over time. (Note: If a vendor has been bought or undergone a name change recently, we still list the vendor by its then-current name. For instance, AT&T and NCR used to be separate companies, but now that they've merged and NCR has been subsumed into AT&T Global Information Solutions, we list the company under a single heading: AT&T/NCR.)

Because service and reliability information is so important to potential buyers, we'll run summary boxes showing each vendor's scores on all three key measures in every applicable review in upcoming issues.

Our Contributors: BILL HOWARD is an executive editor of *PC Magazine.* RACHEL DERBY TEITLER is the research manager for Ziff-Davis Publishing Co. JAMIE BSALES and CAROL VENEZIA are staff editors at *PC Magazine.*

SERVICE & RELIABILITY

Desktop and Laptop PCs



What distinguishes the great vendors from the rest of the pack? Service and support.

By Rachel Derby Teitler and Carol Venezia

The landscape of the PC industry itself has changed dramatically since our last survey of Service and Reliability (published in July 1994). But the fact remains that while there has been some shifting in the ranks, vendors that have historically done well on our survey continue to perform well. And many others continue to show room for improvement.

If the top vendors in the desktop category look familiar to you, it's because they are. These vendors—Compaq, Dell, Digital, Gateway 2000, Hewlett-Packard, IBM, Micron, Northgate, and ZEOS—are our Readers' Choice award winners, as they were on our last survey. In fact, three of these vendors (Dell, Gateway, and ZEOS) have been Readers' Choice recipients for five surveys in a row, since our first was conducted over two years ago.

On the other side of the coin are those vendors whose performances on our surveys have been consistently poor. For Hyundai, Packard Bell, Tandy/Radio Shack, Wyse, and Zenith Data Systems, being at or near the bottom of our Readers' Report Card is not an unfamiliar position.

In the notebook arena, the picture is much the same. Top honors once again go to Apple/Macintosh, Compaq, IBM, and Texas Instruments; this time, they are joined by Gateway and Hewlett-Packard. Although historically there has been a bit more shuffling of the ranks among the notebook vendors, one company—Compaq—has been a Readers' Choice recipient from the very beginning.

THE SURVEY

This survey brings with it ratings of over 18,500 desktop PCs and over 5,300 laptops used in the last two years. Coverage continues to focus on three key measures: reliability, satisfaction with technical support, and satisfaction with repair experiences.

In past surveys, we asked respondents to rate the *reliability* of PCs used in the past two years. This time, however, we asked them to rate their *satisfaction with the reliability* of each PC. This modification was made in order to focus on sub-

HIGHLIGHTS

Service & Reliability: Desktop and Notebook PCs

THE COMPETITION IS HEATING UP for PC vendors, especially in the area of service and support for desktop PCs. It's the age of the three-year warranty, and many vendors are struggling to keep pace with the competition.

OVERALL SATISFACTION has declined since our last survey was published in July of 1994. While a change in the wording of our survey may be the culprit (we now ask respondents to rate their *satisfaction* with overall reliability; on previous surveys, we had simply asked them to rate overall reliability), the upshot remains the same: Average scores for all three key measures in our survey have declined since our last survey.

THIS SURVEY RATED more than 18,500 desktop PCs from 34 different vendors and more than 5,300 laptops and notebooks from 22 vendors. The vendors who earned a grade of A and our Readers' Choice award for desktops are Compaq, Dell, Digital, Gateway, Hewlett-Packard, IBM, Micron, Northgate, and ZEOS. All of these vendors were Readers' Choice recipients in our previous survey, and three—Dell, Gateway, and ZEOS—have been among the best for five surveys in a row.

THE LAPTOP/NOTEBOOK ELITE include Apple, Compaq, Gateway, Hewlett-Packard, IBM, and Texas Instruments. While four of these vendors were Readers' Choice recipients in our previous survey, they are now joined by newcomers HP and Gateway.

Making the Grade

READERS' REPORT CARD: NOTEBOOK SYSTEMS

Grade	Vendor	From 1994
A	Apple/Macintosh	—
	Compaq	—
	Gateway	↑
	Hewlett-Packard	↑
	IBM	—
	Texas Instruments	—
B	AT&T/NCR	*
	NEC	—
	Toshiba	—
C	Acer	↓
	Bondwell	—
	Digital	↓
	Epson	—
D	AST	—
	CompuAdd	↑
	Compudyne	—
	Dell	↓
	Everex	↓
	GRiD	—
	Tandy/Radio Shack	↓
	ZEOS	↓↓
E	ZDS	—

Each arrow represents one step up or down from July 1994.

— Unchanged.

* AT&T now includes NCR.

READERS' REPORT CARD: DESKTOP SYSTEMS

Grade	Vendor	From 1994
A	Compaq	—
	Dell	—
	Digital	—
	Gateway	—
	HP	—
	IBM	—
	Micron	—
	Northgate	—
	ZEOS	—
B	Acer	↑
	AT&T/NCR	*
	Apple/Macintosh	—
	CompuAdd	↑
	Insight	—
	Swan	—
C	AST	—
	Austin	↓
	Compudyne	—
	DTK	—
	Midwest Micro	○
	NEC	—
	PC Brand	—
	Samsung	↑
D	ALR	↓
	Epson	↑
	Everex	—
	Leading Edge	↑
	Unisys	↓
	Wang	—
E	Hyundai	—
	Packard Bell	—
	Tandy/Radio Shack	—
	Wyse	—
	ZDS	—

Each arrow represents one step up or down from July 1994.

— Unchanged. ○ Not previously graded.

* AT&T now includes NCR. Both companies appeared separately in our previous Report Cards.

scribers' actual experiences with the PCs they've used. Results for this newly formatted question yield somewhat lower scores for PCs than the original question, although individual standings relative to the average do not change substantially.

Readers' ratings of the three key measures—satisfaction with reliability, technical support, and repair experience—determine vendor grades as presented in the Readers' Report Cards. To earn a grade of A, a vendor's score on each of the three key measures must be significantly above the overall average. A fourth measure (the likelihood of purchasing a new PC from the same vendor) is also explored but is not considered when calculating grades.

THE PC SCENE

For desktop PCs, the average score for satisfaction with reliability is 7.8; average scores for satisfaction with technical support and satisfaction with repair experience are 7.0 and 7.3, respectively.

For notebooks, the average "satisfaction with reliability" score is also 7.8, while scores for satisfaction with technical support and satisfaction with repair experience are 7.0 and 6.9, respectively.

Of the 34 desktop vendors for which we received at least 50 responses (in our opinion, the minimum number of responses needed to provide stable data), 24 get the same grade as in our last survey; five now enjoy better grades and three drop a grade. (Two vendors are new to the survey.) Of the 22 notebook vendors included in our Readers' Report Card, 12 receive the same grade as in our previous survey, while three improve and six slip in the rankings. Here, one vendor is new.

A: THE HEAD OF THE DESKTOP CLASS

Nine vendors receive an A in this survey and hence win a Readers' Choice award: Compaq, Dell, Digital, Gateway 2000, Hewlett-Packard, IBM, Micron, Northgate, and ZEOS. The majority of these vendors (all but Northgate) also receive above-average scores for future likelihood of buying, an indication that most of these vendors excel in issues of service and reliability and more.

Northgate receives a below-average score for future likelihood of buying. The company has recently been experiencing financial difficulties, which culminated in its filing for bankruptcy protection in August 1994. Before this, Northgate was in the process of downsizing, which included a decrease in its technical-support hours. The company is now hiring more technicians and hopes to return its support schedule to 24 hours a day, 7 days a week.

Tri-Star Computer Corp. (a Readers' Choice award winner in our previous survey) receives only 48 mentions this time—just shy of the requisite 50—and so, in our opinion, the data for this company is not statistically stable. But based on the responses, Tri-Star appears to have only moderate ratings and would not have repeated its grade of A.

THE B VENDORS

Also worthy of mention are the six vendors that receive grades of B: Acer, AT&T, Apple/Macintosh, CompuAdd, Insight, and Swan. Each receives a combination of above-average and average scores.

While Apple, Insight, and Swan each received a B in our previous survey, the specific rankings that Insight and Swan received have changed. Last time, Insight received a B as a result of above-average scores for reliability and satisfaction with repair experience. This time, Insight received above-average scores for satisfaction with technical support and repair experience but an average score for satisfaction with reliability. Swan had previously received above-average scores for satisfaction with both technical support and repair experience. This time, the vendor receives an above-average score for satisfaction with technical support.

Acer's and CompuAdd's B's represent improvements. For Acer, this is the second consecutive survey in which its stand-

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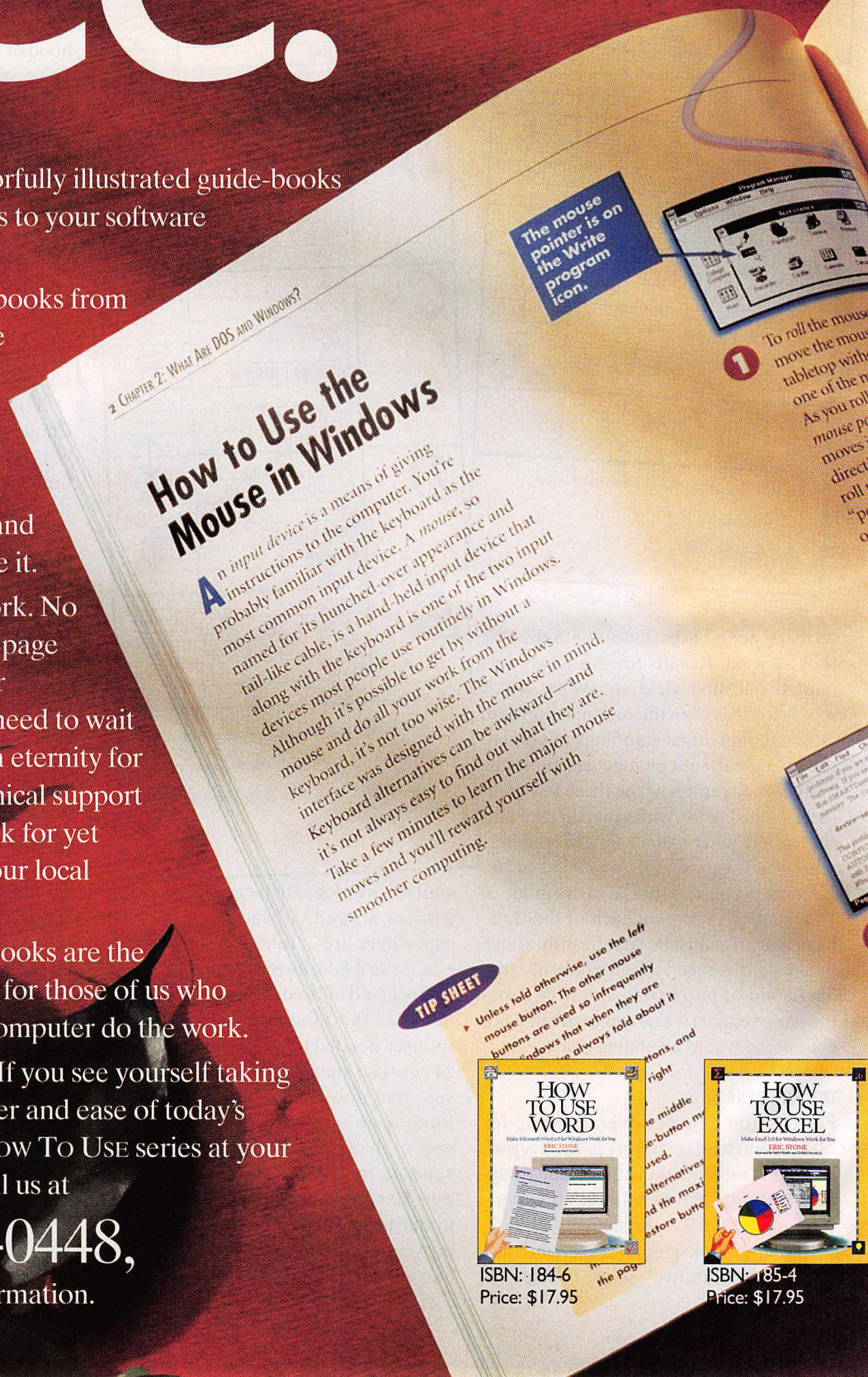
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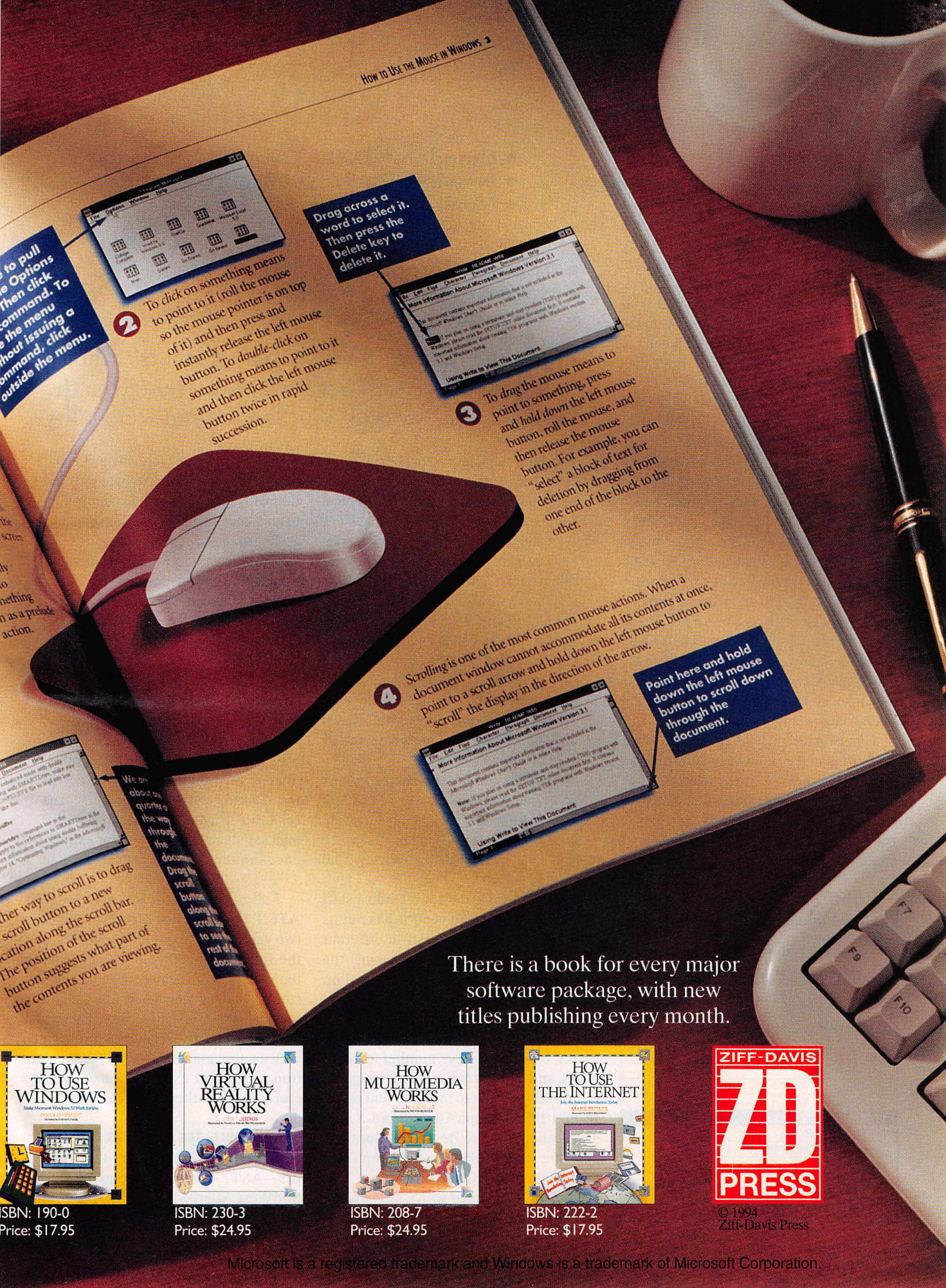
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ing has improved: Its scores for satisfaction with reliability and repair experience rise to above average.

Acer's campaign to better its service has been spearheaded by the introduction in August 1994 of A.C.E.—the Acer Computer Explorer. A.C.E. is a Windows front end loaded onto all systems shipped through the retail channel which, in addition to many other features, facilitates customer registration. This allows Acer to keep a profile of customers, their systems, and any calls to Acer in the company's technical-support database. Acer support technicians have all customer records available on their desktops, so when a customer calls with a question, a documented history is readily at hand.

In the past year, Acer has also instituted a more rigorous certification program for its service providers and has given them access to the Acer Knowledge Base—an on-line database that details features of Acer products. Using this database, service providers can get the information they need to service a customer's system quickly. Other efforts made by the company include Rapid Repair (overnight pickup and delivery of systems for repair) and Acer Answer (an automated voice-response system with prerecorded answers to frequently asked questions).

CompuAdd's rise is the result of its score for satisfaction with technical support improving to above average. The company's grade for notebooks also improves for the same reason. In the past year, CompuAdd has made a number of enhancements to its technical support, which surprisingly do not include a staff increase. Instead, the vendor has put its efforts into training its staff in different areas of technology and tracking the amount of time its customers spend on hold waiting for tech support.

CompuAdd is also now in the process of writing a new software program that tracks call frequency, number of callbacks, and types of calls relating to specific products in order to improve wait times. In mid-1993 CompuAdd started a program called Remote Rescue, a remote diagnostic service that allows CompuAdd technicians to dial directly into a customer's PC (equipped with a modem and diagnostic software) to fix problems.

Desktop Vendors:

• Compaq • Dell • Digital • Gateway • Hewlett-Packard • IBM • Micron • Northgate • ZEOS

Laptop Vendors:

• Apple • Compaq • Gateway • Hewlett-Packard • IBM • Texas Instruments

The vendors that receive our Readers' Choice awards all score significantly above average on the three key measures of our Service and Reliability survey: satisfaction with overall reliability, satisfaction with repair experience, and satisfaction with technical support.

If the Readers' Choice award winners in the desktop category look familiar, it's because they are: All nine received this highest honor from our readers on our last survey of July 1994. In fact, three of these vendors—Dell, Gateway, and ZEOS—have achieved such a level of excellence in service and support in the minds of our readers that they have all been the Readers' Choice award winners for five surveys in a row.

In the notebook sphere, top honors go to four Readers' Choice veterans of our last survey—Apple, Compaq, IBM, and Texas Instruments—which are now joined by Gateway and Hewlett-Packard. Gateway's rise the top is the result of its score for satisfaction with repair experience improving to above average. To Hewlett-Packard go double honors: Its scores for both satisfaction with repair experience and satisfaction with technical support improve to above average in this survey.

Also worthy of mention are the vendors that earned a grade of B in this survey by achieving a combination of average and above-average scores. These vendors include Acer, AT&T, Apple, CompuAdd, Insight, and Swan for desktops and AT&T, NEC, and Toshiba for notebooks. Special recognition goes to Acer in the desktop category, whose scores for both satisfaction with reliability and satisfaction with repair experience vaulted to above average.

Reliability by CPU Type

▲ = Significantly above average
● = Average
▼ = Significantly below average

Desktop Systems	
8086/8088/286/386	7.8 ▼
Intel 486SX/486DX	8.3 ●
Intel 486DX2	8.5 ▲
Intel DX4	8.5 ▲
AMD 486	8.3 ●
Any other 486	8.3 ●
Pentium	8.7 ▲
Average	**8.3**
Notebook Systems	
8086/8088/286/386	7.6 ▼
Intel 486SX/486DX/486SL	8.2 ●
Intel 486DX2	8.5 ▲
Intel DX4	8.7 ▲
Any other 486	8.3 ●
Average	**8.3**

Following the acquisition of NCR by AT&T, this is the first survey in which the two vendors are examined together, and the final product appears to be greater than the sum of the two parts. In our last study, AT&T received an E, while NCR received a C. Currently, the combination of AT&T and NCR yields a grade of B, with an above-average score for satisfaction with repair experience and average scores for the other two measures.

IN THE MIDDLE: THE C VENDORS

Each of the eight vendors that receive C's—AST, Austin, Compudyne, DTK, MidWest Micro, NEC, PC Brand, and Samsung—have average scores for all

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three key measures. AST, Compudyne, DTK, NEC, and PC Brand also received C's on our previous survey. Austin's grade represents a drop from a B on our previous survey to a C—the result of its score for satisfaction with technical support dropping to average. MidWest Micro is examined for the first time in this survey, and while the vendor joins in with a C, it enjoys an above-average score for future likelihood of buying.

Samsung's C is an improvement over the D it received in our last survey and is the result of its scores for satisfaction with both technical support and reliability improving to average. In the past six months, Samsung has hired additional phone support staff, extended technical support hours, and started a fax-back system. The company has reorganized its support department—the Samsung Answer Center—so that all support functions are housed under one roof. Samsung is also in the process of automating its parts warehouse to expedite orders to its service centers.

ROOM FOR IMPROVEMENT

With a combination of below-average and average scores on the three key measures, Advanced Logic Research (ALR), Epson, Everex, Leading Edge, Unisys, and Wang each receive a D. Both Everex and Wang received D's in our previous survey as well. For Epson and Leading Edge, D represents improvement: Epson's score for satisfaction with technical support improves to average, and Leading Edge's scores for satisfaction with repair experience and satisfaction with reliability both improve to average.

For Leading Edge, this leap in the rankings has not come without significant improvement to its technical support. In the past year, Leading Edge has increased its tech support staff by 50 percent and its phone support hours to 7 days a week, 12 hours a day. As of January 1994, its desktop systems are covered under its AdvantEdge service program by the customer's choice of a three-year carry-in or one-year on-site warranty.

ALR continues to shift in our rankings, and most recently, its scores for satisfaction with repair experience and technical support have both dropped to below average. In March of 1993, ALR began offering a 5-year/15-month war-

How Readers Rated PC Vendors

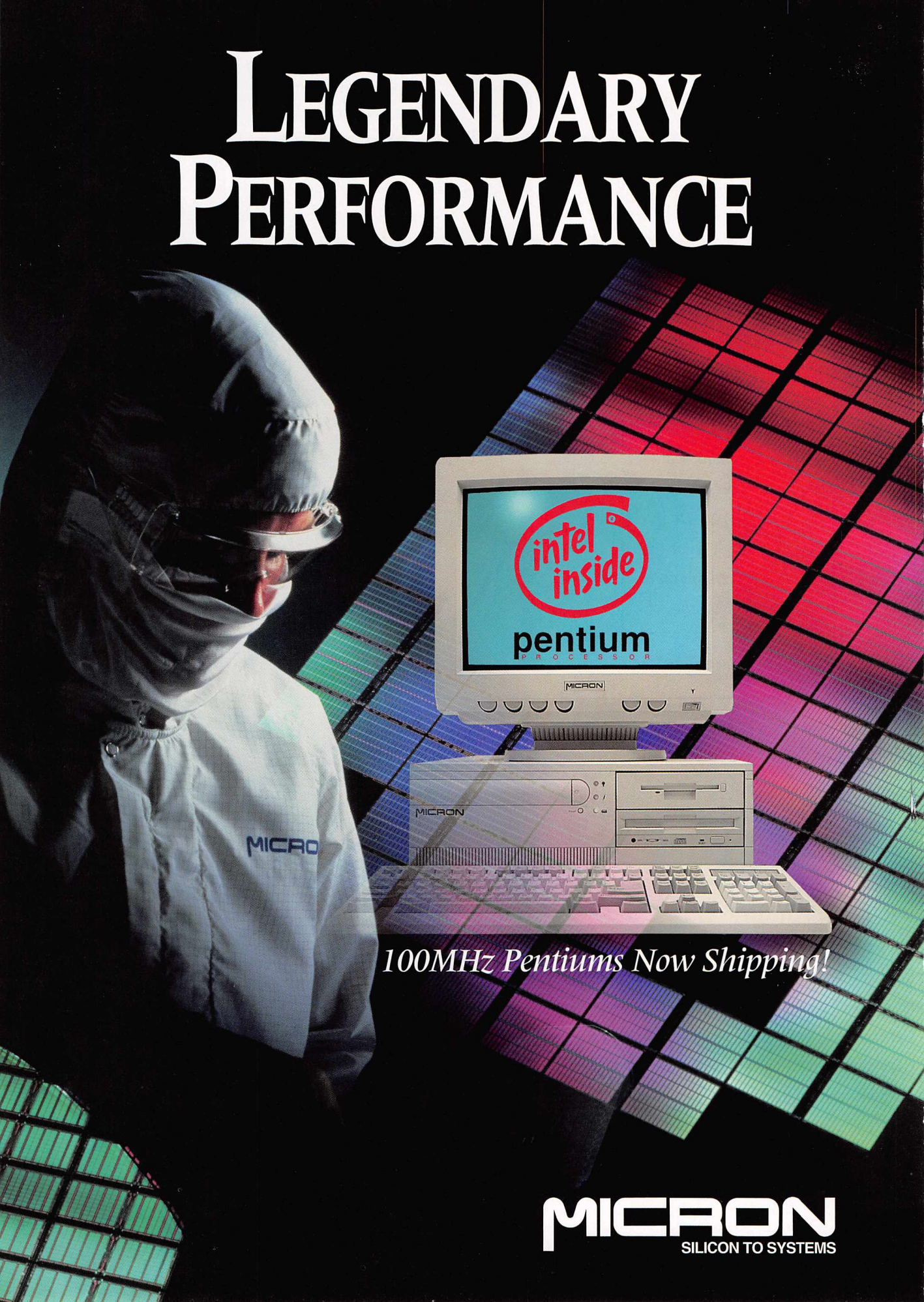
Our survey asked readers to rate up to five desktop and five notebook PCs used in the past two years. We report the ratings for each vendor about which we received at least 50 responses. Vendors were rated on a scale of 1 (worst) to 10 (best). We used a standard t-test of means to identify statistically significant differences between vendors' scores and the average.

▲ = Significantly above average ● = Average ▼= Significantly below average

	Responses	Reliability	Repair	Tech support	Buy again?
DESKTOP VENDORS					
Acer	280	8.2 ▲	7.7 ▲	7.1 ●	6.4 ▲
ALR	176	7.7 ●	6.8 ▼	6.4 ▼	5.4 ●
Apple/Macintosh	552	8.1 ▲	7.5 ●	7.2 ●	6.7 ▲
AST	605	8.0 ●	7.3 ●	7.1 ●	6.4 ▲
AT&T/NCR*	250	7.8 ●	7.7 ▲	7.2 ●	5.8 ●
Austin	101	7.7 ●	7.4 ●	7.6 ●	5.5 ●
Compaq	1,521	8.4 ▲	7.7 ▲	7.7 ▲	7.4 ▲
CompuAdd	322	7.8 ●	7.5 ●	7.4 ▲	5.2 ▼
Compudyne	171	7.8 ●	7.5 ●	6.8 ●	6.1 ●
Dell	1,175	8.4 ▲	8.0 ▲	8.1 ▲	7.8 ▲
Digital	246	8.2 ▲	7.8 ▲	7.9 ▲	6.6 ▲
DTK	294	7.9 ●	7.3 ●	6.6 ●	5.7 ●
Epson	202	7.3 ▼	6.7 ▼	6.5 ●	4.7 ▼
Everex	185	7.8 ●	7.3 ●	6.4 ▼	4.3 ▼
Gateway	2,265	8.6 ▲	8.0 ▲	7.4 ▲	8.2 ▲
Hewlett-Packard	405	8.4 ▲	7.8 ▲	7.7 ▲	7.1 ▲
Hyundai	94	6.7 ▼	6.2 ▼	5.6 ▼	4.0 ▼
IBM	2,516	8.2 ▲	7.6 ▲	7.4 ▲	6.5 ▲
Insight	94	8.2 ●	8.0 ▲	7.6 ▲	6.9 ▲
Leading Edge	283	7.7 ●	6.9 ●	6.3 ▼	5.2 ▼
Micron	142	9.0 ▲	8.8 ▲	8.7 ▲	8.7 ▲
Midwest Micro	84	8.0 ●	7.4 ●	7.1 ●	7.3 ▲
NEC	257	7.9 ●	7.1 ●	6.8 ●	6.2 ●
Northgate	227	8.1 ▲	7.8 ▲	7.7 ▲	5.2 ▼
Packard Bell	918	7.6 ▼	6.6 ▼	6.3 ▼	5.8 ●
PC Brand	109	7.8 ●	7.0 ●	6.5 ●	5.8 ●
Samsung	56	7.3 ●	6.5 ●	6.5 ●	4.7 ▼
Swan	69	8.2 ●	7.7 ●	8.1 ▲	6.5 ●
Tandy/Radio Shack	268	7.3 ▼	6.7 ▼	6.2 ▼	4.5 ▼
Unisys	113	7.3 ▼	6.9 ●	6.3 ▼	4.6 ▼
Wang	72	6.4 ▼	6.3 ▼	6.6 ●	3.3 ▼
Wyse	62	6.6 ▼	6.1 ▼	5.0 ▼	3.4 ▼
ZDS	338	7.3 ▼	6.6 ▼	6.5 ▼	4.7 ▼
ZEOS	617	8.4 ▲	7.8 ▲	7.7 ▲	7.7 ▲
Average		**7.8**	**7.3**	**7.0**	**5.9**
NOTEBOOK VENDORS					
Acer	54	8.0 ●	7.5 ●	7.3 ●	6.8 ●
Apple/Macintosh	159	8.2 ▲	7.8 ▲	7.7 ▲	7.3 ▲
AST	210	7.5 ▼	6.7 ●	6.8 ●	6.2 ●
AT&T/NCR*	54	8.2 ●	7.5 ●	8.1 ▲	6.8 ●
Bondwell	96	7.8 ●	6.7 ●	6.7 ●	5.9 ●
Compaq	729	8.4 ▲	7.6 ▲	7.7 ▲	7.7 ▲
CompuAdd	98	7.3 ▼	5.9 ▼	6.4 ●	4.7 ▼
Compudyne	54	6.8 ▼	6.2 ●	6.4 ●	4.8 ▼
Dell	219	7.3 ▼	6.4 ●	7.1 ●	6.3 ●
Digital	52	8.3 ●	7.4 ●	7.4 ●	6.9 ●
Epson	65	7.3 ●	6.1 ●	6.5 ●	5.8 ●
Everex	64	7.6 ●	5.7 ▼	6.2 ●	5.6 ●
Gateway	201	8.3 ▲	7.9 ▲	7.8 ▲	7.8 ▲
GRiD	71	7.1 ▼	6.0 ●	5.7 ▼	4.9 ▼
Hewlett-Packard	85	8.9 ▲	8.4 ▲	8.5 ▲	8.0 ▲
IBM	540	8.7 ▲	7.9 ▲	8.0 ▲	8.1 ▲
NEC	187	8.3 ▲	6.8 ●	6.9 ●	7.0 ▲
Tandy/Radio Shack	69	7.3 ●	6.2 ●	5.5 ▼	5.1 ▼
Texas Instruments	185	8.2 ▲	7.4 ▲	7.5 ▲	7.3 ▲
Toshiba	853	8.3 ▲	7.1 ●	7.2 ●	7.7 ▲
ZDS	257	7.2 ▼	5.9 ▼	5.8 ▼	4.8 ▼
ZEOS	127	7.3 ▼	5.8 ▼	6.4 ●	5.9 ●
Average		**7.8**	**6.9**	**7.0**	**6.4**

* AT&T now includes NCR.

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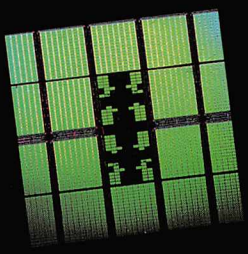


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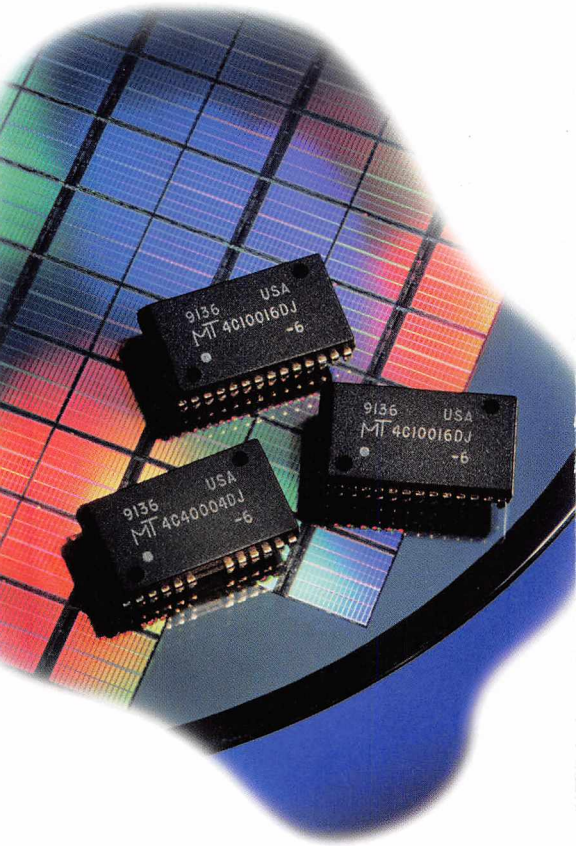
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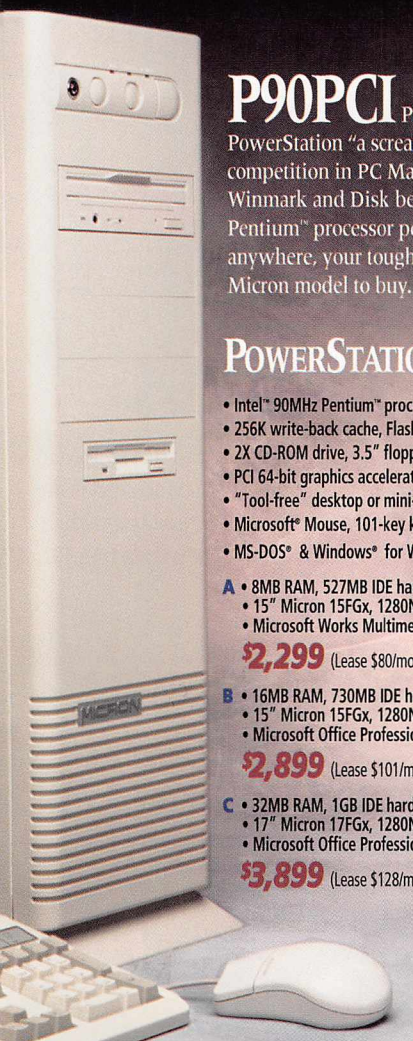
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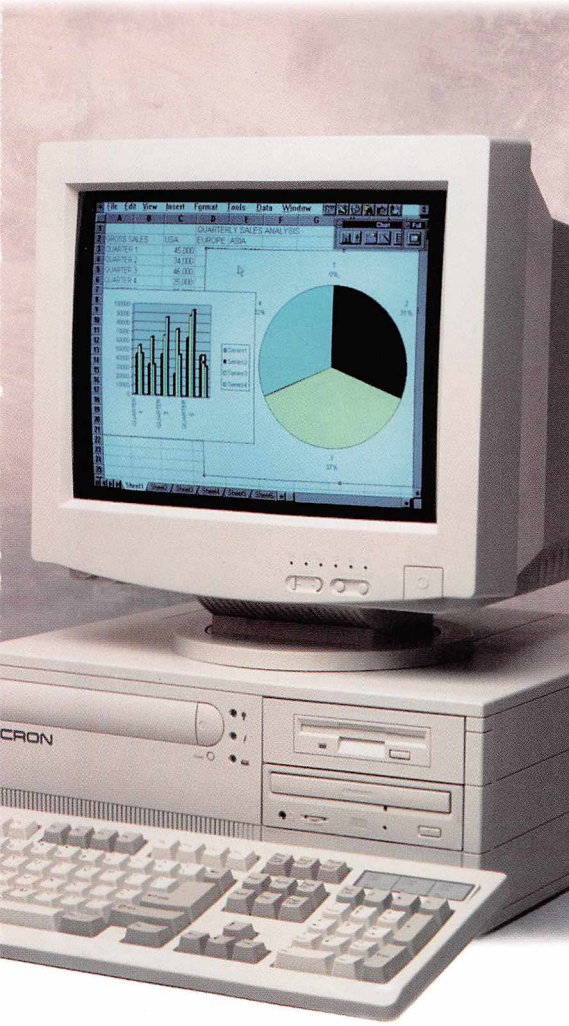
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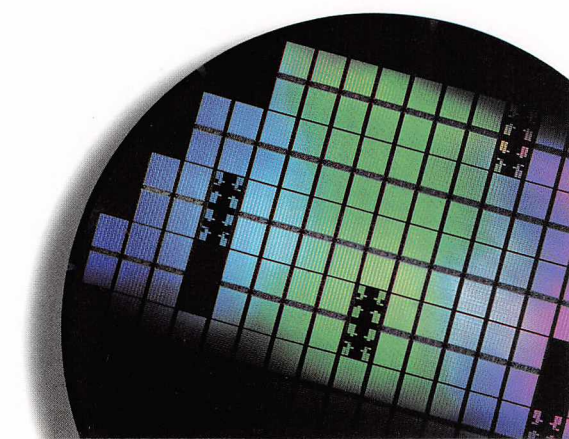
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- 210MB 14ms IDE hard drive
- Local Bus Graphics (1MB)
- 14" Micron 14FG, 1024NI, .28mm
- Low profile chassis
- 5 16-bit ISA slots
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Works for Windows

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THE RECOGNITION

PC MAGAZINE EDITORS' CHOICE

June 28, 1994
Micron P90PCI
POWERSTATION

"The system's components and general design dazzled under Windows."

PCWEEK LABS ANALYST'S CHOICE

June 27, 1994
Micron P90PCI
POWERSTATION

"This machine offers the best available combination of price and performance."

SERVICE & RELIABILITY • PC MAGAZINE • READERS' CHOICE

July, 1994

The highest ratings available in the categories of Overall Reliability, Satisfaction with Technical Support and Future Likelihood of Buying Again.

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P90 HOME MPC

- Intel Pentium 90MHz processor
- 8MB RAM, 256K write-back cache
- 527MB 12ms IDE hard drive (PCI)
- 2X CD-ROM drive, 3.5" floppy drive
- SoundBlaster 16 sound card, speakers & joystick
- 14.4/9600 Fax/Modem & WinFax Lite
- PCI 64-bit graphics accelerator (2MB)
- 14" Micron 14FG, 1024NI, .28mm
- "Tool-Free" desktop or mini-tower
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Works Multimedia CD, Microsoft Encarta CD, Quicken Deluxe Edition CD
- Trial subscriptions for Compuserve, America OnLine & Prodigy
- LucasArts CD games: Rebel Assault, Day of the Tentacle, Indiana Jones and the Fate of Atlantis

$2,499

486 HOME MPC

- 2X CD-ROM drive, 3.5" floppy drive
- SoundBlaster 16 sound card, speakers & joystick
- 9600/2400 Fax/Modem & WinFax Lite
- Local bus graphics (1MB)
- 14" Micron 14FG, 1024NI, .28mm
- Low profile chassis
- Microsoft Mouse, 101-key keyboard
- MS-DOS & Windows for Workgroups
- Microsoft Works Multimedia CD, Microsoft Encarta CD, Quicken Deluxe Edition CD
- Trial subscriptions for Compuserve, America OnLine & Prodigy
- LucasArts CD games: Rebel Assault, Day of the Tentacle, Indiana Jones and the Fate of Atlantis

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CIRCLE 164 ON READER SERVICE CARD

Vendor Grades: Past and Present

	January 10, 1995	July 1994	January 11, 1994	July 1993	February 9, 1993
DESKTOP VENDORS					
Acer	B	C	D	D	E
ALR	D	C	E	C	D
Apple/Macintosh	B	B	B	C	C
AST	C	C	B	B	A
AT&T/NCR*	B	E/C	E/C	E/C	E/D
Austin	C	B	B	A	C
Compaq	A	A	B	A	B
CompuAdd	B	C	C	A	B
Compudyne	C	C	C	C	N/A
Dell	A	A	A	A	A
Digital	A	A	B	B	A
DTK	C	C	D	C	C
Epson	D	E	D	C	C
Everex	D	D	C	C	B
Gateway	A	A	A	A	A
Hewlett-Packard	A	A	A	B	B
Hyundai	E	E	E	D	E
IBM	A	A	B	B	B
Insight	B	B	N/A	N/A	N/A
Leading Edge	D	E	E	E	D
Micron	A	A	B	N/A	N/A
Midwest Micro	C	N/A	N/A	N/A	N/A
NEC	C	C	D	B	B
Northgate	A	A	B	A	A
Packard Bell	E	E	E	E	D
PC Brand	C	C	C	C	C
Samsung	C	D	C	C	N/A
Swan	B	B	A	A	A
Tandy/Radio Shack	E	E	E	E	E
Tri-Star	N/A	A	C	B	C
Unisys	D	C	C	D	C
Wang	D	D	D	D	D
Wyse	E	E	D	E	E
ZDS	E	E	E	E	E
ZEOS	A	A	A	A	A
NOTEBOOK VENDORS					
Acer	C	B	N/A	N/A	N/A
Apple/Macintosh	A	A	A	B	C
AST	D	D	D	B	C
AT&T/NCR	B	N/A	N/A	N/A	N/A
Bondwell	C	C	D	D	E
Compaq	A	A	A	A	A
CompuAdd	D	E	C	C	B
Compudyne	D	D	E	E	N/A
Dell	D	C	B	A	B
Digital	C	B	B	N/A	N/A
Epson	C	C	C	D	C
Everex	D	C	C	C	B
Gateway	A	B	A	C	N/A
GRiD	D	D	C	C	C**
Hewlett-Packard	A	B	N/A	N/A	N/A
IBM	A	A	B	A	B
NEC	B	B	D	D	D
Sharp	N/A	D	C	D	D
Tandy/Radio Shack	D	C	C	D	C**
Texas Instruments	A	A	C	C	C
Toshiba	B	B	B	A	B
ZDS	E	E	E	E	E
ZEOS	D	B	C	A	A

N/A—Not applicable: The vendor did not receive the minimum 50 responses needed for inclusion in this survey.

*AT&T now includes NCR. Both companies appeared separately in previous surveys.

** GRiD Systems Corp. and Tandy/Radio Shack appeared as one entity in this survey.

ranty (5 years on the motherboard, power supply, keyboard and chassis; 15 months on other components such as the hard disk and CD-ROM drive) on all desktop systems. The company also has a fax-back service, as well as a bulletin board on CompuServe.

With below-average scores on all three key measures, Hyundai, Packard Bell, Tandy/Radio Shack, Wyse, and ZDS each repeat their E grades. Early in 1994, Packard Bell opened a new service center in Magna, Utah (its old center in Chatsworth, California, was destroyed in an earthquake). At startup, this center was staffed by 90 technicians; that number has grown to over 700 today.

Wyse has recently put a new management staff in place to improve its service and support. The company is targeting three areas for improvement: reducing customer hold times for tech support, further educating phone support staff, and streamlining the telephone voice-response system.

Hyundai has made changes as well. Under its new Return Call program, customers who call technical support and leave a message will be called back within 15 minutes. However, Hyundai has also reduced the number of phone support technicians it employs.

Since our last survey, ZDS has also made improvements to its service. The company now provides 24-hour, 7-day technical support. It has also more than doubled its number of on-site service providers and has increased telephone support staff by 30 percent.

THE LAPTOP LEADERS

This survey brings another A for Apple, Compaq, IBM, and Texas Instruments. These vendors are joined by Gateway and Hewlett-Packard, each of which also receives a grade of A and a Readers' Choice award. All of these six have above-average scores on each of the three key measures.

For Gateway, its score for satisfaction with repair experience improves to above average. The company has recently combined its customer service and technical support operations into a single customer-support department. It has also just opened a new phone-support facility in Kansas City, which will bring the total number of phone-support technicians the company employs to 800 by the end of 1994.



Imagine this: Once every 15 seconds someone in the USA buys a new CTX color monitor.

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*Official 1993 Monitrak U.S. monitor sales research.

CIRCLE 329 ON READER SERVICE CARD

Hewlett-Packard's scores for satisfaction with repair experience *and* technical support both improved to above average. According to Eric Skinner, HP's worldwide support manager for mobile products, HP is committed to providing as much convenience to its customers as possible, since many people who use mobile products do indeed use them on the road. HP offers a program called Express Exchange: Once a problem has been diagnosed by an HP technician, a request is electronically transmitted to HP's service center and a new part or a new system unit is shipped to the customer overnight. This service has been available since June of 1993; it is also included in the three-year warranty that HP will provide with its new color notebooks—the OmniBook 600 and the OmniBook 4000, which will be available by the time you read this.

Also worthy of note are AT&T, NEC, and Toshiba, each of which receives a combination of above-average and average scores and earns a grade of B. For NEC and Toshiba, this is a repeat performance. Previously, neither AT&T nor NCR had received enough mentions to allow the vendors to be examined for their notebooks. Together, however, these two vendors yield stable data worthy of a B as a result of an above-average score for satisfaction with technical support.

IN THE MIDDLE OF THE PACK

With average scores on all three key measures, Acer, Bondwell, Digital, and Epson each receive a C. The newcomers to this level are Acer and Digital, each of which received a B in our previous study. For Acer the drop is a result of a decline in its score for satisfaction with repair experience; Digital's scores for satisfaction with both technical support and reliability similarly drop.

Digtal's efforts in the notebook market have historically centered around satisfying customer demands with OEM machines. All that is changing, however: In November of 1994, the company announced its Hi-Note line of portable systems, which are designed by Digital engineers and manufactured by Citizen.

ROOM FOR IMPROVEMENT

The largest group of laptop vendors make up the D category: AST, CompuAdd, Compudyne, Dell, Everex, GRiD, Tandy/Radio Shack, and ZEOS. For AST, Compudyne, and GRiD, this represents a repeat performance. For Dell, Everex, Tandy, and ZEOS, D's represent a poorer performance than in the past. ZEOS's grade (down from a B grade on our previous survey) results from a drop in the scores on all three key measures. CompuAdd is the only vendor in this group to show improvement from the previous survey. Note also that although GRiD (formerly a subsidiary of Tandy) was purchased by AST over a year ago when AST bought Tandy's computer operations, the company is still rated separately on our survey.

Dell's grade has fallen because its score for satisfaction with technical support has dropped to average. During 1993, the vendor did not sell any notebooks; in January 1994, Dell introduced its new Latitude portables. The Latitude line has brought with it the introduction of a technical-support staff dedicated to mobile products. All support technicians use a notebook PC and are equipped with the same PCMCIA cards and communications software that Dell sells, so problems can be replicated.

ZEOS has made a number of improvements to its service, including expanding the reach of its bulletin board services to include America Online. The company will implement an automated voice-response system in the coming months that will provide answers to commonly asked questions. ZEOS has also just introduced a new line of notebook PCs—called Meridian—jointly engineered and developed with Sanyo Electronics.

With below-average scores on all three key measures, ZDS continues to receive a grade of E. But as in the desktop arena, an unusually large number of respondents rating ZDS notebooks based their answers on 386 or slower systems.

WHAT NEXT?

So what can future PC buyers expect? Consider where the market stands right now: One-year warranties are rapidly being replaced by three-year guarantees. New technologies are supplanting the old at a rapid-fire pace. Buyers are getting more for their money now than ever before. These forces are converging to create the best of all worlds for the buyer: cutting-edge technology, backed by superior service and support, for an affordable price. Expect no less.

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SERVICE & RELIABILITY

Monitors

Our survey finds readers most satisfied with the reliability of their monitors.



READERS' REPORT CARD: MONITORS

Grade	Vendor	From 1994
A	NEC	—
	Sony	↑
B	Compaq	↑
	CTX	↑
	IBM	↑
	MAG InnoVision	↓
	Nanao	—
C	Acer	↑
	AST	—
	Philips/Magnavox	—
	Mitsubishi	↓
	Panasonic	—
	Relisys	—
	Samtron	—
	Tatung	—
	ViewSonic	↓
D	GoldStar	—
	Hyundai	↓
	Packard Bell	↓
	Samsung	—
	Tandy/Radio Shack	↓
	ZDS	—

Each arrow represents one step up or down from January 11, 1994.
— Unchanged.

By Rachel Derby Teitler and Jamie Bsales

This year, a total of 22 monitor vendors received the minimum of 50 mentions to qualify for inclusion in our Readers' Report Card. As we saw a year ago when we first included monitors in our Service and Reliability surveys, readers continue to rate displays as being highly reliable. In fact, the average rating for satisfaction with reliability is a strong 8.5—the best average score among the four hardware categories covered by the survey.

Since our last survey, subscribers' perceptions of five monitor vendors have improved, reflected by higher grades on the Report Card, while six vendors receive lower grades this year. This year, grades of A and our Readers' Choice awards go to NEC and Sony, the only two monitor vendors to receive above-average scores on each of the three service and support measures: satisfaction with reliability, satisfaction with technical support, and satisfaction with repair experience. For market leader NEC this is a repeat performance, while Sony's score for satisfaction with repair experience improves over last year's average showing, bumping Sony up from a B last year.

Also performing well, earning a grade of B, are Compaq, CTX, IBM, MAG, and Nanao. Companies that advanced are Compaq, CTX, and IBM, moving up from the C level last year. Both Compaq and IBM receive improved scores of above average for satisfaction with technical support, while CTX's scores for satisfaction with both tech support and repair experience improve to above average.

MAG, on the other hand, receives average scores for satisfaction with repair experience and technical support this year in contrast to its above-average scores last year. Nanao's score for satisfaction with repair experience slips to average; at the same time, satisfaction with tech support has risen to above average, so the company maintains its B grade.

With three average scores each, nine vendors earn C's: Acer, AST, Mitsubishi, Panasonic, Philips (which also markets the Magnavox brand name), Relisys, Samtron, Tatung, and ViewSonic. AST, Panasonic, Philips, Relisys, Samtron, and Tatung also received C's in our previous survey. Mitsubishi and ViewSonic each fared better

HIGHLIGHTS

Service & Reliability: Monitors

THE MOST RELIABLE piece of hardware, at least in the perception of our surveyed readers, is the monitor: Satisfaction with reliability averages 8.5 on a scale of 10, though for repair experience and technical support, it is not as high.

TWO VENDORS, NEC and Sony, have above-average scores on our three key measures (satisfaction with reliability, repair, and tech support). Compaq, CTX, IBM, MAG, and Nanao receive above-average scores in two of the three categories.

WOULD READERS BUY another monitor from the same vendor? Six vendors—MAG, Mitsubishi, Nanao, NEC, Sony, and ViewSonic—receive thumbs up. For GoldStar, IBM, Tandy/Radio Shack, and ZDS, the answer is thumbs down.

Monitor Vendors:

- **NEC Technologies**
- **Sony Electronics**

Of the 22 monitor vendors that made our study of service and reliability this year, two stand above the rest.

The subscribers who responded to our survey rate NEC and Sony monitors consistently above average in our three main areas: satisfaction with reliability, satisfaction with repair experience, and satisfaction with technical support.

This is the second year in a row that NEC has earned this honor in our survey. On the first measure, reliability, NEC receives an average 9.2 out of a possible 10 from the 895 NEC users who have responded—compared with an average of 8.5 for the 22 vendors together. Sony, which moves up a grade from the B level last year, scores a strong 9.1. On satisfaction with repair experience and technical support, NEC averages 8.3 and 8.5, respectively, versus the field average of 7.2 in each case. Sony scores a laudable 8.2 and 7.9 in these areas. And it should come as no surprise that readers report a strong likelihood of buying a monitor from these vendors in the future: 8.8 (the highest score we saw) for NEC and 8.4 for Sony, well above the average of 7.2.

We find a large proportion of the Sony respondents—18 percent—report on a Sony monitor 19 inches or larger. Only 3 percent of respondents overall report on screens that size. NEC has a large proportion of responses for its midsize monitors (17 inches): 24 percent, versus 13 percent for responses in general.

last time, but average showings for reliability this year give each an overall grade of C. Acer's overall grade improves from a D to a C this time around, as readers reported higher satisfaction with reliability.

Once again this year, no monitor vendor receives our poorest grade, E. But six—GoldStar, Hyundai, Packard Bell, Samsung, Tandy/Radio Shack, and ZDS—find themselves at the D level. GoldStar, Samsung, and ZDS each received a D last time; Hyundai, Packard Bell, and Tandy/Radio Shack move down from a C. For both Hyundai and Tandy/Radio Shack, the drop is a result of a fall in the scores for satisfaction with reliability to below average. Packard Bell's decline is a result of a below-average score for satisfaction with repair experience.

Perhaps the most telling measurement on our survey is the fourth: future likelihood of buying a new monitor from the same vendor. It is no surprise that both our Readers' Choice winners—NEC and Sony—receive above-average ratings here, along with four other vendors: MAG, Mitsubishi, Nanao, and ViewSonic. Our readers slap IBM, GoldStar, Tandy/Radio Shack, and ZDS with below-average scores in this measure. For the latter three, the scores track closely with the overall grades of D the vendors received. But for IBM, the rebuff is surprising. IBM is the only company among the A's and B's not to get at least an average score for the likelihood of buying again. Since a wide range of factors figured into a reader's response here (such as price, company image, the color of the case), it's impossible to determine an exact cause for this.

From our survey results we can see other trends that reflect the monitor market as a whole. For instance, last year 87 percent of the readers who responded were using small displays (from 13 to 15 inches, measured on the diagonal). This year, that figure has dropped to 82 percent. The migration has been toward medium-size monitors (16- or 17-inch), which now represent 13 percent of the responses, up from 8 percent. The percentage of respondents using large screens (19 inches or larger) remains constant at 3 percent.

How Readers Rated Monitor Vendors

Our survey asked readers to rate up to five monitors used in the past two years. We report the ratings for each vendor about which we received at least 50 responses. Vendors were rated on a scale of 1 (worst) to 10 (best). We used a standard t-test of means to identify significant differences between vendors' scores and the average. Deviations from the average are not always statistically significant; thus, some vendors may show the same score but have different grades.

▲ = Significantly above average ● = Average ▼ = Significantly below average

Vendor	Responses	Reliability	Repair	Tech support	Buy again?
Acer	104	8.7 ●	7.3 ●	7.1 ●	7.5 ●
AST	101	8.7 ●	6.8 ●	7.4 ●	7.2 ●
Compaq	248	8.5 ●	7.6 ●	7.8 ▲	7.3 ●
CTX	366	8.5 ●	7.9	7.7 ▲	7.2 ●
GoldStar	145	7.8 ▼	6.3 ●	6.0 ▼	6.3 ▼
Hyundai	85	7.9 ▼	6.8 ●	6.5 ●	6.7 ●
IBM	527	8.4 ●	7.5 ●	7.9 ▲	6.7 ▼
MAG	202	8.9 ▲	7.6 ●	7.6 ●	8.0 ▲
Mitsubishi	122	8.8 ●	6.9 ●	7.4 ●	7.7 ▲
Nanao	90	9.1 ▲	8.1 ●	8.2 ▲	8.7 ▲
NEC	895	9.2 ▲	8.3 ▲	8.5 ▲	8.8 ▲
Packard Bell	304	8.5 ●	6.4 ▼	6.7 ●	7.1 ●
Panasonic	74	8.8 ●	7.9 ●	7.3 ●	7.1 ●
Philips/Magnavox	87	8.5 ●	6.3 ●	6.3 ●	6.7 ●
Relisys	58	8.5 ●	5.3 ●	5.7 ●	6.9 ●
Samsung	213	8.2 ▼	6.9 ●	6.9 ●	6.8 ●
Samtron	67	8.3 ●	7.7 ●	7.3 ●	7.0 ●
Sony	196	9.1 ▲	8.2 ▲	7.9 ▲	8.4 ▲
Tandy/Radio Shack	65	8.0 ▼	7.5 ●	6.4 ●	5.3 ▼
Tatung	52	8.5 ●	7.5 ●	7.8 ●	6.6 ▼
ViewSonic	201	8.7 ●	6.8 ●	7.0 ●	7.9 ▲
ZDS	118	8.0 ▼	6.5 ●	6.7 ●	5.9 ▼
Average		**8.5**	**7.2**	**7.2**	**7.2**

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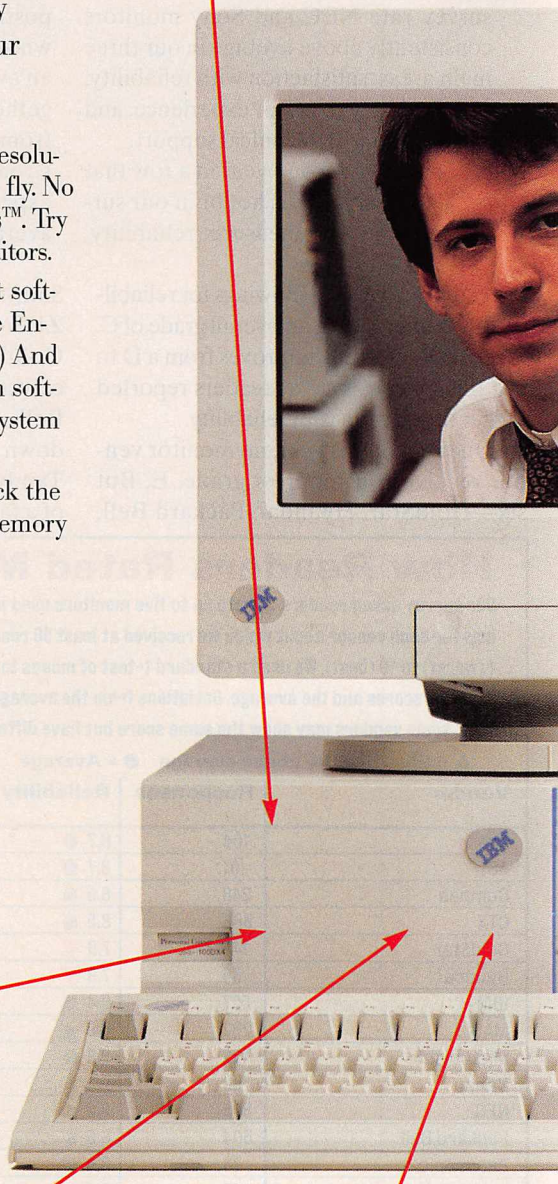
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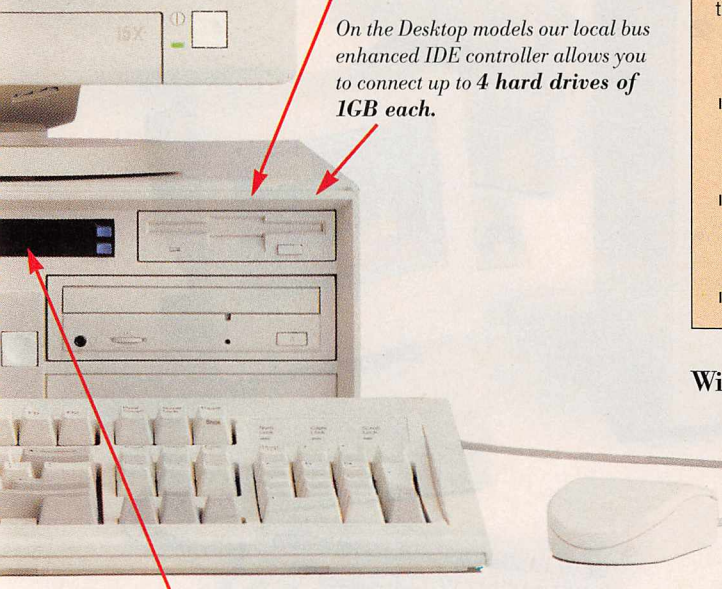
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SERVICE & RELIABILITY

Printers

Printers are fairly reliable companions, but only one vendor—HP—is Grade A.



READERS' REPORT CARD: PRINTERS

Grade	Vendor	From 1994
A	Hewlett-Packard	—
B	Brother	○
	Canon	↑
	Epson	↓
	Panasonic	—
C	Apple/Macintosh	—
	Digital	↓
	IBM/Lexmark	↑
	NEC	↑
	Okidata	—
	Tektronix	○
	Texas Instruments	—
D	Citizen America	↓
	QMS	↓
	Star Micronics	↓
E	Tandy/Radio Shack	↓

Each arrow represents one step up or down from July 1994.
— Unchanged. ○ Not previously graded.

By Rachel Derby Teitler and Jamie Bsales

Printers are beasts of burden, but despite their constant toil and mechanical nature they are still admirably reliable. With an average score of 8.1, printers as a group fare well in satisfaction with reliability among the hardware products in our survey (bested only by monitors, with a score of 8.5).

Only one major printer manufacturer fares well enough in our survey to earn a Readers' Choice award this time around: Hewlett-Packard. Notably, the lion's share of the 7,945 printers rated—45 percent of all printers and 72 percent of the laser printers—are HP units. With above-average scores for satisfaction with reliability, repair experience, and technical support, HP tops all others and earns a grade of A on our Readers' Report Card.

Other strong performers are Brother, Canon, Epson, and Panasonic, each of which earns a B grade. Panasonic is the only vendor in this group that also received a B in our previous survey. Epson had previously earned an A but slips because its score for satisfaction with repair experience falls to average. Canon, the only vendor to receive the majority of its ratings for ink jet printers, rises from a C to a B as its scores for satisfaction with reliability and technical support jump to above average. Brother is a newcomer to our survey, receiving more than the required 50 responses for inclusion for the first time.

Apple, Digital, Lexmark (which markets the Lexmark and IBM brand names), NEC, Okidata, Tektronix, and Texas Instruments each receive a C as a result of average scores for each of the three service and support measures. For Lexmark and NEC this represents improvement: Lexmark's score for satisfaction with reliability improves to average, as do NEC's scores for satisfaction with both repair experience and technical support. Digital's C is a result of its rating for satisfaction with technical support falling to average, which causes the vendor to drop from the

HIGHLIGHTS

Service & Reliability: Printers

ONE IS THE LONELIEST number, unless you're sitting in a class by yourself. That's where HP emerges on this year's survey: Among the 16 printer vendors represented, HP is the only maker to earn above-average scores for satisfaction with reliability, repair service, and technical support.

MAKING A GRADE of B and also deserving recognition are four vendors: Brother, Canon, Epson, and Panasonic. A mix of average and above-average scores from our readers places these companies ahead of most others.

HIGH-END COLOR printers are becoming more common, as evidenced by the appearance of Tektronix on our survey for the first time. Most of our readers responding about Tektronix units use one of the company's thermal wax transfer color units.

PEOPLE ARE LEAST HAPPY with dot matrix and thermal wax transfer printers. Satisfaction with reliability is lower for these printers than for either lasers or ink jets.

Printers:

• Hewlett-Packard

A total of 16 printer vendors received enough responses to be included in this statistical roundup. Only Hewlett-Packard makes a grade of A, however.

This year, Hewlett-Packard stands alone as the sole recipient of our Readers' Choice award for printers, the only printer vendor to receive above-average scores on every measure of service and reliability.

Over 3,500 of the 7,945 printers that our subscribers report on were HP units, more than triple the next-closest vendor (Epson, with just over 1,000). Almost three-quarters of the laser printers mentioned are from the market leader. In the category of satisfaction with reliability, HP earns an average score of 9 out of a possible 10, above the average of 8.1 for printers on the whole and the highest among its peers. HP also scores above the others in satisfaction with repair experience (8.7, versus the average 7.4) and satisfaction with technical support (8.5, versus the average 7.4). Respondents also indicate they would be inclined to buy another printer from HP, giving the maker a score of 9.2—well above the average of 6.9.

A quartet of other printer vendors also deserve special mention, each receiving mixed rankings of average and above average in the categories and earning a grade of B: Brother, Canon, Epson, and Panasonic. Panasonic earns a B grade for the second year in a row, Brother is a newcomer to our survey, and Canon has improved from the last time around, when it landed in the C level. Epson had earned an A and a Readers' Choice award previously, but this time its score for satisfaction with repair experience drops to average.

The only printer vendor to do particularly poorly, receiving below-average scores in all our main categories, is Tandy/Radio Shack.

B level last year. Color printing is steadily becoming more prevalent in the corporate market, as evidenced by the appearance this year of Tektronix—the only vendor to receive the majority of its ratings for thermal wax transfer printers.

FALLING FROM GRACE

Each of the vendors that receive a D in this year's study—Citizen America, QMS, and Star Micronics—performed better in our previous survey. Citizen's scores for reliability and tech support drop to below average; QMS's score for satisfaction with repair experience and Star Micronics' score for satisfaction with technical support also fall to below average.

Bringing up the rear is Tandy/Radio Shack, the lone recipient of an E. Tandy managed just a D last year, and its scores for satisfaction with both technical support and repair experience fall this year, which means that its marks on all three of our critical measures are now below average.

OTHER TRENDS

An examination of printers by type, without respect to brand, reveals that users are more satisfied with laser printers and ink jets than with dot matrix printers and thermal wax transfer printers. Respondents rate dot matrix and thermal wax printers as below average when it comes to reliability, which is attributable at least in part to the mechanical nature of the former and complexity of the latter. Of the six printer vendors that receive lower grades in this survey than in our last, four (Citizen, Epson, Star Micronics, and Tandy/Radio Shack) each receive the majority of their ratings for dot matrix printers.

Four printer manufacturers each receive from 25 to 49 mentions from our respondents: Alps, Dataproducts, Fujitsu, and Toshiba (which no longer sells printers). Though fewer than 50 responses is not enough for statistical confidence, we can glean some insight into reader satisfaction with those brands. Scores from the limited samples place Alps, Dataproducts, and Fujitsu right in the middle of the pack on all three measures. □

How Readers Rated Printer Vendors

Our survey asked readers to rate up to five printers used in the past two years. We report the ratings for each vendor about which we received at least 50 responses. Vendors were rated on a scale of 1 (worst) to 10 (best). We used a standard t-test of means to identify significant differences between vendors' scores and the average. Deviations from the average are not always statistically significant; thus, some vendors may show the same score but have different grades.

▲ = Significantly above average ● = Average ▼= Significantly below average

Vendor	Responses	Reliability	Repair	Tech support	Buy again?
Apple/Macintosh	137	8.2 ●	7.5 ●	7.2 ●	6.9 ●
Brother	63	8.5 ▲	8.5 ▲	8.0 ●	6.9 ●
Canon	305	8.5 ▲	7.8 ●	7.8 ▲	8.2 ▲
Citizen	159	7.5 ▼	7.1 ●	6.6 ▼	5.7 ▼
Digital	50	8.3 ●	7.8 ●	8.1 ●	6.7 ●
Epson	1,002	8.4 ▲	7.6 ●	7.7 ▲	7.6 ▲
Hewlett-Packard	3,569	9.0 ▲	8.7 ▲	8.5 ▲	9.2 ▲
IBM/Lexmark	313	8.1 ●	7.7 ●	7.7 ●	7.1 ●
NEC	175	8.0 ●	7.0 ●	7.3 ●	6.6 ●
Okidata	394	8.1 ●	7.6 ●	7.5 ●	7.3 ▲
Panasonic	895	8.3 ▲	7.6 ●	7.6 ●	7.4 ▲
QMS	87	7.8 ●	6.4 ▼	6.9 ●	6.2 ●
Star Micronics	161	7.9 ●	6.6 ●	6.6 ▼	6.5 ●
Tandy/Radio Shack	63	6.8 ▼	5.9 ▼	5.4 ▼	4.1 ▼
Tektronix	59	7.8 ●	8.0 ●	8.0 ●	7.2 ●
Texas Instruments	69	7.9 ●	6.8 ●	7.1 ●	7.1 ●
Average		**8.1**	**7.4**	**7.4**	**6.9**

Five Good Reasons To Buy Peachtree Accounting For Windows.

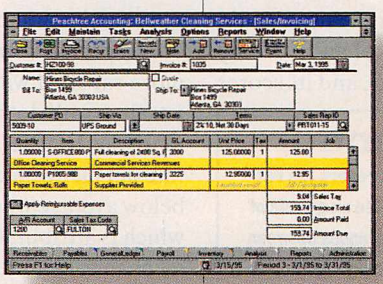
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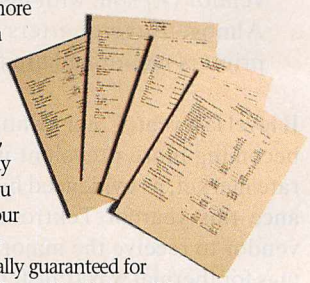
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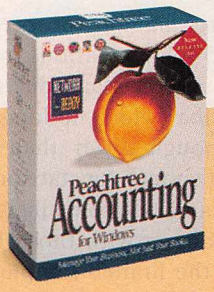
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PERSONAL FINANCE



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Accuracy. Speed. Convenience. True on-line power. If you're not using personal finance software, you're missing out on something valuable.

By Holly McL. Ketron

Any lingering doubts about the significance of personal finance software should be laid to rest by Microsoft Corp.'s $1.5 billion proposed purchase of field-leader Intuit in October. Microsoft's personal finance package, Microsoft Money, had been a respected but marginal player in the field. Now the company has bought into an ever-widening universe of software and services that let tens of millions of PC users take control of their finances on a level that had previously been reserved for the sophisticated few.

Financial institutions and international money wizards have been zooming wealth around electronically for years, taking advantage of currency shifts, interest rate fluctuations, and the like. Today you can enter that same electronic world with simple clicks and keystrokes. Increasingly, you can move your

Illustration by Douglas Levere

wealth around from employer to bank to investment account to retirement nest egg—and we're on the brink of even greater power and freedom in these areas.

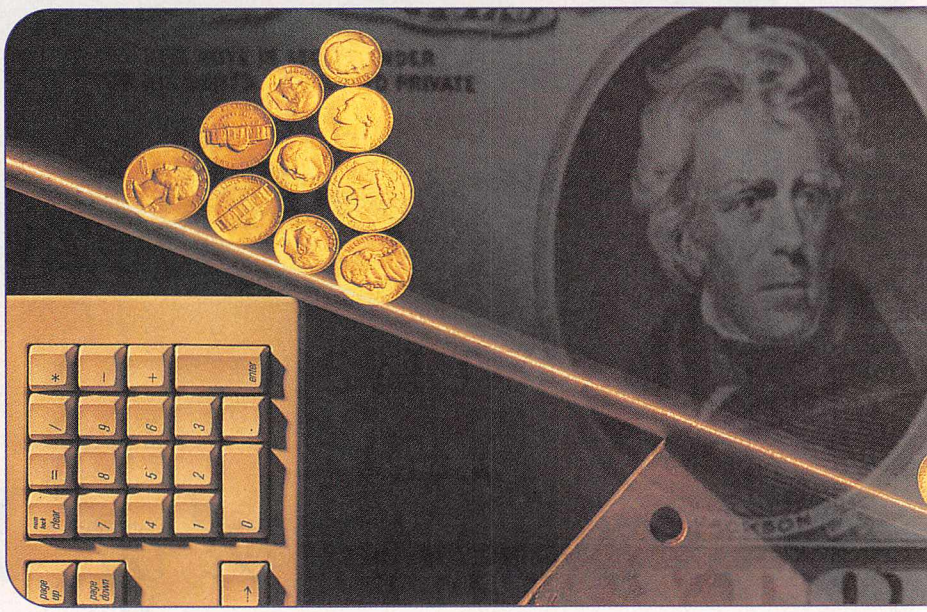
When financial chores are dealt with quickly and efficiently, many worries subside. But the *big* worries, the ones that keep us awake at night—fears for the future, the nagging conviction that we need to plan, to save, to have a strategy—these remain. Today's personal finance software offers succor for these larger problems too, in the form of investment advice and guidance.

The packages we've evaluated won't print money for you or guarantee that you'll never buy high and sell low, but they do explain basic money management principals and give you the guidance you need to achieve real financial control. Planning for college, saving for a secure retirement, getting a hammerlock on debt: These once burdensome and daunting jobs can be handled at your PC—no muss, no fuss.

Read on for a two-pronged report that covers the best of today's personal finance software packages. The first part deals with general financial managers, the second with the emerging universe of investment software. We also offer in-depth sidebars on computerized financial advisors, retirement planning, tax matters, and electronic banking.

Beyond the Balancing Act

Beyond bill-paying and checkbook balancing, today's best personal finance products give you insight into your fiscal well-being.



By Gregg Keizer and Kathy Yakal

A computer checkbook is brutally honest. It refuses to lie about your financial health, spelling out in black and white exactly where your money's gone and how much is left. It's like a take-no-excuses accountant on retainer.

Today's personal finance packages extend that candor far beyond the family checkbook. They portray the current state of everything from your budget to your investments in ways even the fiscally phobic can digest; they even watch over your shoulder to make sure bills are paid on time. The best will tell you what you'll owe the IRS, plot out your future cash flow, and offer some straight-talking financial advice.

SOME THINGS STAY THE SAME. . .

When it comes to the basics, the eight programs we review here—Kiplinger's Simply Money 2.0, Managing Your Money (Version 11.0 for DOS and Version 2.0 for Windows), MoneyCounts (Version 8.0a for DOS and Version 8.0b for Windows), Microsoft Money 3.0, and Quicken (Version 4 for Windows and Version 8 for DOS)—illustrate the elevated plateau

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Illustration by Douglas Levere

that personal finance software has reached. All offer on-screen checks and registers, and all automate the entry of transactions to a large degree. All create and monitor budgets, let you draw conclusions from a wide range of reports and graphs, and account for mortgage loans, investment portfolios, and other tangible assets.

On the level of basic home financial chores (such as check writing or expense tracking), these packages are so competent that, in most cases, we can say they've reached the end of the enhancement line.

. . .SOME THINGS CHANGE

That's not to say personal finance software is standing still—not at all. Since we last reviewed these programs a little less than a year ago, all have added new functionality and features.



All are paying especially close attention to ease-of-use issues. As an example, both Managing Your Money for Windows and Quicken 4 can replace the traditional icon-centered toolbar with a simpler interface designed to entice newcomers. All work hard to get you going and, once you're up and running, help you through the rough spots. Quicken 4's start-up, for instance, is like an in-depth interview; Simply Money's comprehensive help includes generous amounts of financial advice; and Microsoft Money's Wizards step you through complicated chores.

Analyzing financial information has long been one of this category's strengths. But only Intuit (slated to merge with Microsoft later this year) has stepped beyond the already generous supply of customizable reports and graphs. With Quicken 4 for Windows's Snapshot feature, you can choose any combination of up to six charts and graphs and display them simultaneously. Managing Your Money for Windows also has a snapshot, which shows condensed reports rather than charts.

Some major improvements have been made to these products' tax-estimating capabilities. Managing Your Money, the traditional leader here, offers year-round, detailed looks at your current tax picture; makes projections from budget figures; and provides a quarterly tax planner. Simply Money, Microsoft Money, and MoneyCounts have more limited internal tax skills, though Quicken now offers a full-blown tax planner along the lines of MYM. All packages export data to personal tax preparation programs in .TXF format. And Quicken 4 users can access a new dynamic link to TurboTax that both imports data directly from Quicken and lets you make adjustments that are automatically reflected in both programs.

Every title reviewed here can create simple investment accounts, but MYM and Quicken 4 still have the edge over the competition. They offer more advice and customizable views, respectively.

IT'S ALL INFO

Though every personal finance software vendor will likely continue to tweak its program's core functions, the really revolutionary changes to the category will come from expanding connections to external financial institutions and resources. Quicken and Money have led the way with their pioneering work in electronic banking services (see the sidebar "Dial-Up Banking? Wait till Next Year. . ." in this issue's Trends section for more details), but few financial institutions support their efforts as of this writing. MECA Software's parent company, H&R Block, recently signed a letter of intent with Visa Interactive to develop customized versions of

PC MAGAZINE EDITORS' CHOICE

• Quicken 4 for Windows

Few titles dominate their category as unfailingly as Quicken, Intuit's (or will it be Microsoft's?) personal finance manager. This year, the proof is concrete: Quicken 4 for Windows sits atop the electronic money-manager pile as our sole Editors' Choice.

The evolutionary steps taken by Quicken 4 for Windows are not as substantial as those in previous years. Still, the addition of a tax planner, a graphical one-stop-shopping view of finances, and a simplified, customizable interface is more than enough to keep it ahead of the competition. Quicken retains and even improves on its ease of use, offers the most complete online help, remains an excellent investment and budget manager, and provides the most flexible reporting, complete with drill-down capabilities. Its electronic banking functions, albeit no match for Microsoft Money's, include bill-paying, stock price updates, and the Intellicharge credit card.

Surprisingly close on Quicken's heels—for such a relative newcomer—is MECA Software's Managing Your Money for Windows. We give it an honorable mention. Though it lacks many features that Quicken has, it does a good job of covering the functions we feel the vast majority of users are most likely to use. Perhaps its most serious shortcoming today is its slowness; those without state-of-the-art hardware will find it frustrating. MYM for Windows needs to quicken its pace and incorporate all the reports, graphs, and financial calculators that its still-admirable DOS sibling supplies today. If it does so, it will be a first-rank contender.

Our Contributors: THERESA W. CAREY is a freelance writer who focuses on financial management software for personal and business use. GREGG KEIZER is a freelance writer for various computer, technology, science, and entertainment publications. HOLLY MCL. KETRON is a senior reporter for *Money* magazine. KATHY YAKAL is a journalist who has covered the PC industry since 1983. TED STEVENSON was the associate editor in charge of this story, and AMARENDRA SINGH was the project leader.

Suitability to Task: Personal Finance Software

Personal finance managers should make money management faster and easier while providing insight into your financial situation. These Suitability to Task ratings compare personal finance managers on their abilities to handle the most common money-management chores quickly and easily. They also evaluate the level of information analysis you can glean from the data you've collected. We split tasks into five categories: checkbook management, budgeting, tax and financial planning, portfolio management, and electronic connections.

SUITABILITY TO TASK

Product Name

	Power	Ease
Checkbook management	EXCELLENT	POOR
Budgeting	GOOD	FAIR
Tax and financial planning	FAIR	GOOD
Portfolio management	POOR	EXCELLENT
Electronic connections	EXCELLENT	POOR

Checkbook management is the core of every personal finance manager. To receive an excellent rating, a program should assist users in setting up their accounts. It should fully automate the process of writing and recording income and expenses, remembering recurring transactions and handling many of the data entry chores. It should also aid account reconciliation and allow users to edit and add transactions from within the reconciliation module.

A good finance manager also includes **budgeting** features—such as sorting income and expenses by category, setting spending and earnings objectives, and providing detailed reports—that can provide insight into your finances. A good budgeting module can help you spot unusual spikes in your spending and find places ripe for cutting.

Once you've collected all this data, it's good to have help with **tax and financial planning.** The better finance managers help you figure out your tax liability throughout the year, enabling you to take action to reduce your tax burden. They also help you make smart decisions about loans and savings plans.

The logical extension of checkbook management is **portfolio management.** A package should be able to track a wide variety of investments (such as stocks, bonds, and mutual funds), differing transaction types (such as dividend reinvestments and selling short), and investment goals. It should also provide advice to help you make decisions.

Electronic connections to bill-paying services or on-line stock quotes can keep you on time with payments and up to date on prices. Some programs even allow electronic access to credit card information.

Managing Your Money for early 1995 delivery. This will allow individual banks to sell customized versions of MYM, which will include on-line banking links.

Even without such futuristic links, the current crop of personal finance software demonstrates that you don't have to be a control freak to find value in computer-managed finance. These software packages really work. They won't give you complete freedom from money matters, but they offer something even better: information. Honest information.

4Home Productions

• Kiplinger's Simply Money

The version number and maker's name may have changed, but Version 2.0 of 4Home Productions' $69.99 Kiplinger's Simply Money doesn't differ much from last year's model. This Microsoft Windows–based personal finance manager still relies on an unusual icon-dependent interface, still is easy to set up, and still is a good pick for day-to-day banking. But by essentially standing still, it's falling behind other, more innovative titles.

Simply Money doesn't dwell on the checkbook metaphor but presents drag-and-drop icon buttons. To pay a bill, you drag the payee's button and drop it onto the checkbook icon. It's certainly slick, but experienced hands may find it tedious.

MEMORIZED MONEY

Of the managers we reviewed, Simply Money is one of the easiest to set up. With its ten preconfigured account types and three sample sets of categories, you'll be up and running quickly. Version 2.0 also allows you to import Quicken data, a boon to those switching financial fealty.

Entering transactions is a snap; since Simply Money memorizes all payees, a couple of keystrokes usually brings up the appropriate one in a pop-up list. But you can't disable this feature, so writing checks to one-time payees requires an extra step. Future and recurring transaction scheduling is flexible. But account reconciliation lacks amenities other packages provide, such as error identification.

SUITABILITY TO TASK

Kiplinger's Simply Money

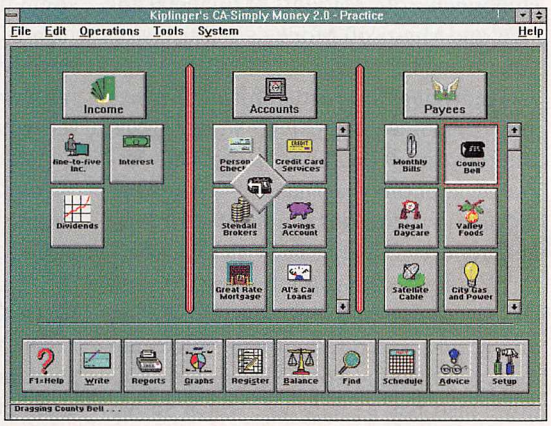
	Power	Ease
Checkbook management	FAIR	FAIR
Budgeting	FAIR	FAIR
Tax and financial planning	FAIR	FAIR
Portfolio management	FAIR	POOR
Electronic connections	FAIR	FAIR

Perhaps the biggest addition to Version 2.0 is a link to CheckFree, the on-line bill-paying service. For those who prefer traditional bill-paying, check printing is now smoother, with alignment options, test printing, and support for three check styles.

BEHIND THE TIMES

When you move beyond basic banking, Simply Money shows its age. Reporting and charting are relatively inflexible. Simply Money also lacks a tax estimation planner. But it can link categories to specific tax forms and schedules, as well as export data in .TXF format.

Budgeting and investment tracking are equally limited. The program can build a



Kiplinger's Simply Money 2.0's icon interface lets you bank by moving buttons.

budget from existing data, but it only shows a single year's information. And while its portfolio manager handles various securities transactions, Simply Money can't obtain quotes on-line unless you have a CompuServe account.

The package's one shining light is its Kiplinger-provided financial advice: There is three times as much as there was in Version 2.0. It's informative, comprehensive, and available with a single click. But that doesn't make up for an out-of-step feature set. Though Simply Money is still an acceptable choice for beginners, experienced electronic bankers should move on with their money.—*Gregg Keizer*

▶**Kiplinger's Simply Money, Version 2.0.** 4Home Productions (a division of Computer Associates International), *One Computer Associates Plaza, Islandia, NY 11788-7000; 800-773-5445, 516-342-2000; fax, 516-342-6854.*

Circle 444 on reader service card

MECA Software Inc.

● Managing Your Money for DOS
● Managing Your Money for Windows

For 10 years, MECA Software's DOS-based Managing Your Money (MYM) has earned respect for its advanced investment tracking, tax and financial planning and guidance, and capable checkbook management and budgeting features. In 1994, MECA played catch-up by releasing four new versions of this veteran: MYM for DOS 10.0 and 11.0 ($79.95) and the long-awaited MYM for Windows 1.0, followed six months later by Version 2.0 (also $79.95). The last of these has features that nearly match, and sometimes surpass, its DOS predecessor's—and the increased usability makes it a formidable rival for Intuit's latest Quicken for Windows.

GIVE AND TAKE

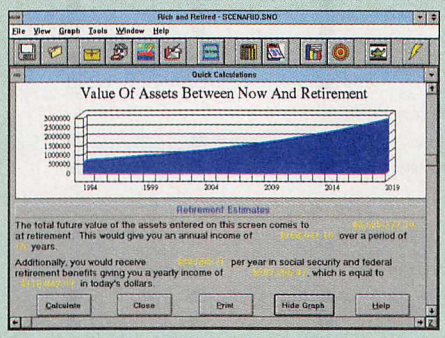
MYM for Windows has three different income/expense templates (the DOS version has one), but account and category setup is easy in both. The DOS version provides a brief tutorial but no sample data.

MYM for Windows offers flexible setup options for recurring transactions and memorizes fields to speed up trans-

■ Retirement Planning: *Are You an Ant or a Grasshopper?*

By Theresa W. Carey

Recall the fable of the ant and the grasshopper: While the grasshopper whiled away the warm summer days, the ant collected provisions for the winter ahead. When winter came, the grasshopper was miserable; happily, the ant was generous enough to share.



Rich and Retired uses your data to show how much money you'll have at retirement.

Don't count on ants (or others) to help you after you retire, though. If you don't start putting something away soon, you could spend your golden years serving burgers at the Golden Arches. But we take a look at the current crop of software packages that help you write your own happy ending; here's how they stack up.

By far, the easiest and most complete retirement planning package available is Rich and Retired ($59.95 DOS or Windows), from DataTech Software. Rich and Retired interviews you with its Walk-Through feature, which includes a life-expectancy calculation as well as estimates of your Social Security income. R&R can read your Quicken or Managing Your Money asset and budget files, which streamlines the data entry process.

R&R has some advanced features, such as calculating how much you'll come out ahead by selling your primary residence and buying a smaller home. It even includes federal retirement plans for those who are eligible.

Several less thorough retirement planners are available as well: Fidelity Investments publishes Thinkware ($50, written by Reality Technologies, the publishers of WealthBuilder). Thinkware contains five modules, starting with a primer covering retirement concepts (the benefits of tax-deferred investments, for example). In the Retirement Needs section, Thinkware prompts you for information such as desired retirement income, anticipated expenses, and current investments. Then the Investment Strategy module determines your personal retirement strategy, based on your feelings about risk and how much time you have to implement a plan. Finally, the program provides your Action Plan, and a plug for the Fidelity family of mutual funds. The program is adequate, and the strategy plan is a nice touch.

Harvest Time, Version 3.1 ($49.95), from The Computer Lab, offers a terrific suite of dedicated calculators (the tax calculator is particularly strong), but its interface is vintage 1988. Retirement income, cash flow, and cash shortfall are displayed in sharply drawn bar graphs. Harvest Time looks at your investments to determine when they should be used after you retire, and figures your taxes, which can vary significantly from year to year. The Computer Lab also offers a retirement planning package for professional financial advisors.

These programs add functionality to your personal financial analysis system that can't be found elsewhere. So be an ant, and get on top of your plans for the future. □

SUMMARY OF FEATURES

CONTINUES

Personal Finance Software

PC MAGAZINE EDITORS' CHOICE

Products listed in alphabetical order ■ = YES □ = NO	Kiplinger's Simply Money 2.0	Managing Your Money for DOS 11.0	Managing Your Money for Windows 2.0	Microsoft Money 3.0	MoneyCounts for DOS 8.0a	MoneyCounts for Windows 8.0b	Quicken 8 for DOS	Quicken 4 for Windows
List price	$69.99	$79.95	$79.95	$14.95 through January 31, 1995; $24.95 thereafter	$29.00	$29.00	$49.99	$49.99
User interface	Windows	DOS	Windows	Windows	DOS	Windows	DOS	Windows
General Features								
Calculator/Calendar	■□	■■	■■	■■	■■	■■	■■	■■
Customizable toolbar	□	□	■	□	□	■	□	■
On-line help	■	■	■	■	□	□	■	■
Pop-up context-sensitive help	■	■	■	■	■	■	■	■
On-line or written tutorial	■	■	■	■	Optional	Optional	■	■
Sample data	■	□	□	□	□	□	□	□
Number of sample income and expense templates	3	1	3	1	5	5	3	3
Help with accounting principles	■	■	■	□	■	■	■	■
Can import data from other personal finance programs	■	■	■	■	■	■	■	■
Banking Functions								
Number of account types	10	9	7	5	14	14	6	8
Maximum number of subcategories per category	4	Unlimited	Unlimited	Unlimited	N/A	N/A	15	15
Memorizes recurring transactions	■	■	■	■	■	■	■	■
Schedules future transactions	■	■	■	■	■	■	■	■
Reconciles accounts	■	■	■	■	■	■	□	□
Offers electronic banking	□	□	■	■	□	□	□	□
Links to electronic credit card statements	□	■	■	■	□	□	■	■
Bill Payment								
Provides bill-payment reminders	■	■	■	■	■	■	■	■
Links to electronic bill-paying services	■	■	■	■	Optional	Optional	■	■
Service providers	BillPay USA, CheckFree	CheckFree	CheckFree	Pay On-Line	CheckFree	CheckFree	CheckFree	CheckFree
Prints laser, ink jet, and dot matrix checks	■	■	■	■	■	■	■	■
Budgeting Features								
Includes preset budget categories	■	■	■	■	■	■	■	■
Splits transactions among categories	■	■	■	■	■	■	■	■
Forecasts future income and expenses or cash flow	■	■	■	□	■	■	■	■
Automatically sets up budget account	■	■	□	■	■	■	■	■
Multiyear budgeting	□	■	■	■	■	■	□	□
Reports								
Number of predefined reports	37	56	29	13	29	32	26	28
Customizable charts/reports	■	■	■	■	■	■	■	■
Creates an instant report from any transaction	■	■	■	□	□	□	■	■
User can view supporting data or transactions from report view	□	□	■	□	□	□	■	■
User can write reports to screens/disk/printer	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■□■
Charts and Graphs								
Number of predefined charts	31	19	8	10	20	20	4	4
Customizable charts/reports	□■	■□	■■	□□	■□	□■	■■	■■
3-D charts and graphs	■	■	■	□	■	■	□	■
User can view supporting data or transactions from chart view	■	□	■	■	■	■	■	■
User can view multiple charts on-screen simultaneously	■	■	□	□	□	■	□	■
Portfolio Management								
Multiple views of portfolio	■	■	■	■	■	■	■	■
Customizable views	■	■	■	■	□	□	■	■
Multiple portfolios	■	■	■	■	■	■	■	■
Keeps historical price information	■	■	■	■	■	■	■	■
Number of predefined transaction types	17	11	11	13	4	4	19	13
Links to on-line quote service	■	■	■	■	■	■	■	■

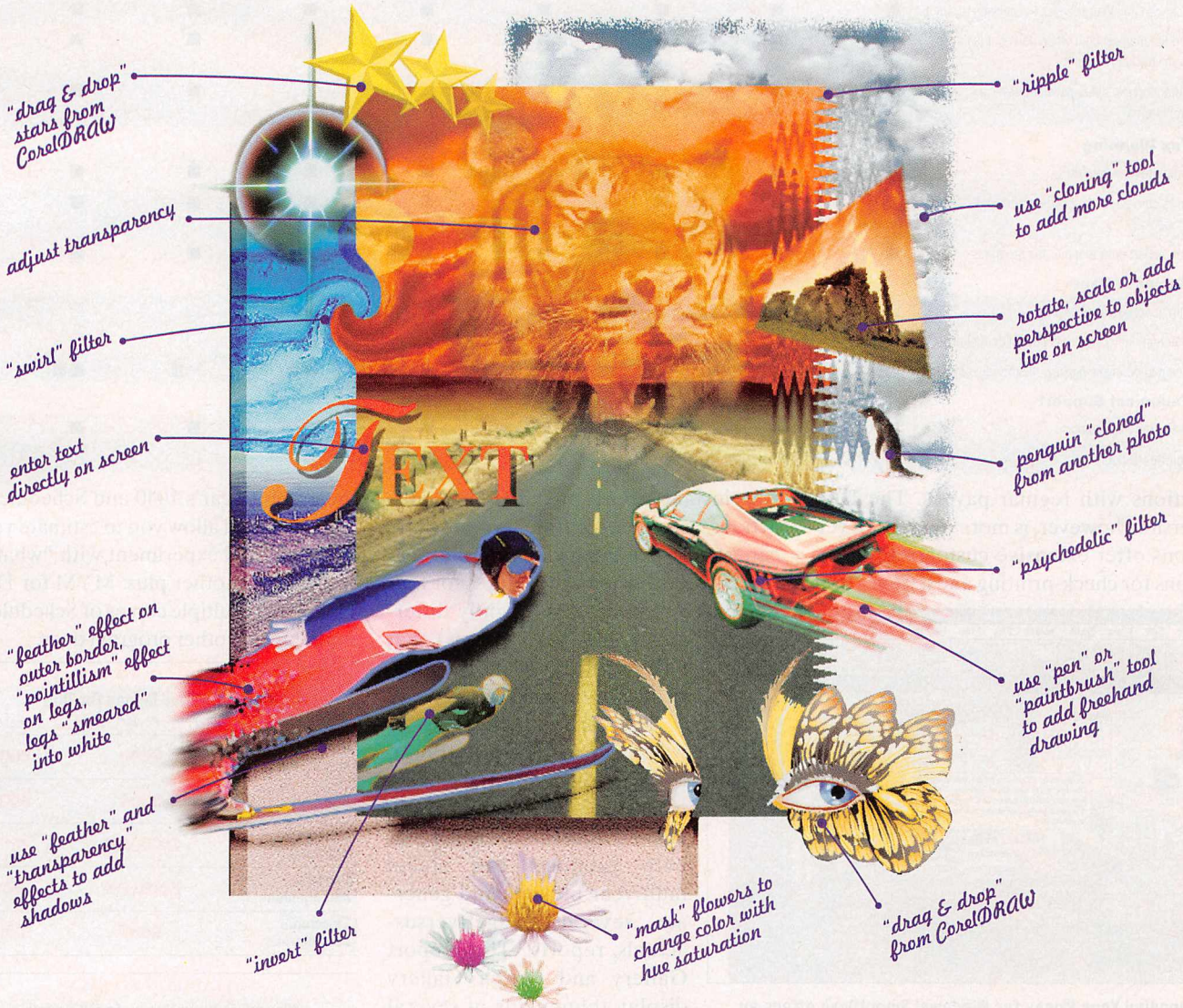
N/A—Not applicable: The product does not have this feature.

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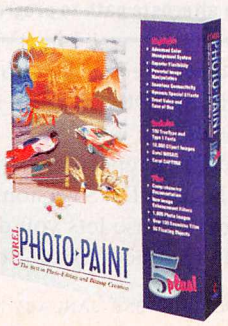
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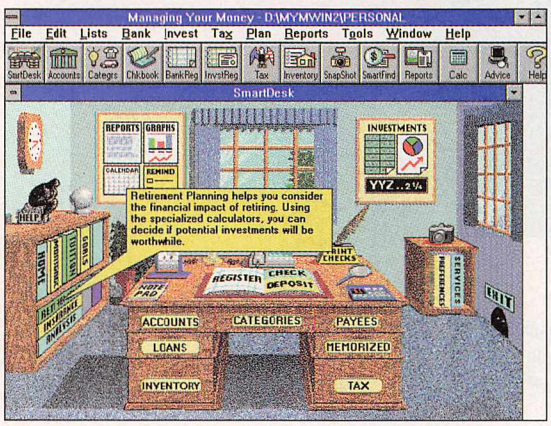
SUMMARY OF FEATURES

ENDS

PC MAGAZINE EDITORS' CHOICE

Products listed in alphabetical order ■ = YES □ = NO	Kiplinger's Simply Money 2.0	Managing Your Money for DOS 11.0	Managing Your Money for Windows 2.0	Microsoft Money 3.0	MoneyCounts for DOS 8.0a	MoneyCounts for Windows 8.0b	Quicken 8 for DOS	Quicken 4 for Windows
Financial Planning								
Calculates loan-amortization tables	■	■	■	■	■	■	■	■
Number of financial-planning calculators	8	20	13	5	2	2	5	5
Debt-management planning	□	■	■	□	□	□	□	□
Loan Tracking								
User can link loan account to checking account	■	■	■	■	■	■	■	■
Credits loan account when payment is made from checking account	■	■	■	■	■	■	■	■
Automatically splits payment between principal and interest	■	■	■	■	□	□	■	■
Tax Planning								
Estimates tax liability	□	■	■	□	■	■	■	■
Links categories to specific forms and schedules	■	■	■	■	■	■	■	■
Can export data to major tax programs	■	■	■	■	■	■	■	■
Business Uses								
Can generate invoices	□	■	□	□	Optional	Optional	□	□
Automatically calculates payroll deductions	□	□	□	□	Optional	Optional	□	□
Companion invoicing/payroll software available	□□	□□	□□	□□	■■	■■	M■	■■
Technical Support								
Unlimited free support	■	■	■	■	■	■	■	■
Toll-free support	□	□	□	□	■	■	□	□

actions with regular payees. The DOS version, however, is more rigid. Both versions offer extensive customization options for check-printing and a CheckFree link. You can reconcile accounts in both, but only the DOS version searches for possible errors.



Managing Your Money for Windows' SmartDesk offers an intuitive alternate path to program functions.

Predefined reports are still more plentiful in MYM's DOS version, but the new Windows release lets you drill down to original transactions; a Zoom feature runs instant reports on individual transactions, accounts, securities symbols, and categories. The Financial Snapshot feature displays bottom-line figures for four key indicators (slightly different in the two versions) that give you an at-a-glance summary of your financial picture.

Though budgeting has always been MYM's strong suit, the Windows version is unable to build a budget based on past years' figures. Nonetheless, both products can create multiyear budgets and generate several budget-versus-actuals reports. The Report Gallery and Graph Gallery display thumbnails of several commonly used reports and graphs. You can click on one to access its report generator screen, but samples don't reflect real data.

MANAGING YOUR ASSETS

MYM continues to outshine its competition in tax planning and forecasting. Both versions move previously entered data into the current year's 1040 and Schedules A through F and allow you to estimate year-end taxes and experiment with "what if" scenarios. Another plus: MYM for DOS 11.0 allows multiple copies of Schedule C, something no other program does.

SUITABILITY TO TASK

Managing Your Money for DOS

	Power	Ease
Checkbook management	GOOD	GOOD
Budgeting	GOOD	GOOD
Tax and financial planning	EXCELLENT	GOOD
Portfolio management	EXCELLENT	FAIR
Electronic connections	GOOD	GOOD

SUITABILITY TO TASK

Managing Your Money for Windows

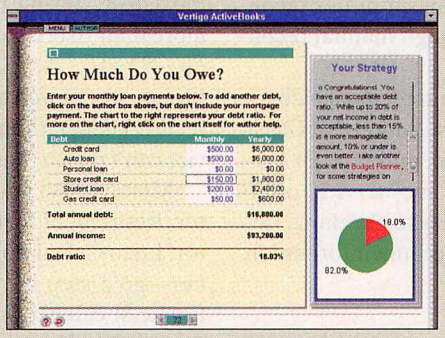
	Power	Ease
Checkbook management	EXCELLENT	EXCELLENT
Budgeting	GOOD	GOOD
Tax and financial planning	EXCELLENT	EXCELLENT
Portfolio management	EXCELLENT	EXCELLENT
Electronic connections	GOOD	GOOD

Expert Money Advice—And Lots of It

By Kathy Yakal

Personal finance programs continue to evolve, but they're still not up to full strength in education and planning. Each offers tools in this area—features like financial calculators, online expert advice, budgeting, tax projection—but overall, they're better at helping you document than dream and plan.

So if you need help finding ways to make those reports and graphs reflect a better financial future, several products available on disk and CD-ROM can fill that gap. They combine advice from economic experts with worksheets, calculators, personalized step-by-step strategies, and, in some cases, audio and video clips.



Jonathan Pond's Personal Financial Planner offers personalized investment strategies.

Vertigo Development Group (800-942-2848, 617-225-2065) publishes three of these. One is Jonathan Pond's Personal Financial Planner ($39.95 on disk, $49.95 on CD-ROM), which grants you a personal audience with the renowned money maven and helps you create a detailed personal financial plan. Take his Wealth Test and read the sections Pond suggests based on his assessment of your needs and goals. Then fill in the questionnaires and worksheets and the program will deliver your SmartPlanner Report—a series of suggested actions based on your input. The CD-ROM version contains over 20 minutes of video clips of Pond.

A similar approach to financial education and planning is offered in Vertigo's The Wall Street Journal Personal Finance Library ($39.95). Covering topics such as Debt Reduction, Investment Strategies, Retirement Planning, and LifeTime Savings Strategy, this title sprinkles worksheets throughout its text and also calculates answers and suggests courses of action.

The last in the Vertigo trio, Your Best Money Moves Now ($39.95), calls on the resources of *Money* magazine and books and uses a combination of expert text and interactive worksheets. After you browse and fill in the appropriate ActiveInformation pages, the editors suggest strategies for dealing with issues like investments, tax reduction, new Social Security laws, and proposed healthcare reform.

Friendly Software Corporation (800-968-4654) offers Charles J. Givens' Money Guide, available on disk ($39.95) and CD-ROM ($49.95). Both editions contain the same elements. In Wealth Management, you build a record-management system and formalize financial goals using Givens' ten steps. The Ten Biggest Money Management Mistakes tutorial helps you identify and rectify common spending errors. Finally, Ask Charles J. Givens offers answers to hundreds of commonly asked financial questions. The CD-ROM version includes 131 video clips of Givens expounding on numerous financial topics.

Some people say you have to spend money to make money. These programs have the potential to pay for themselves several times over. □

Other personal finance programs have evolved from checkbook managers to full-blown financial managers, but MYM has always been the best tool for investors. The DOS and Windows versions are uneven in terms of functionality, though you can set up multiple portfolios and access current quotes on-line in both. Securities profiles are quite thorough, letting you track variables such as liquidity, risk, tax status, industry, and dividends. MYM can handle complex portfolios, even those with puts and calls, strike prices, and reinvestment of dividends. The program also analyzes your investment trends and makes customized recommendations for changes.

Financial analysis has long been one of MYM's selling points. Several dedicated financial calculators help you make informed decisions on such topics as buying versus leasing, buying life insurance, and planning for college or retirement.

MYM's original designer, financial guru Andrew Tobias, offers abundant advice and guidance throughout both programs. The package is aimed at helping you reduce your debt and make often simple but always smart moves toward improving your financial future.

Though their feature sets are growing more similar, MYM for Windows' interface is far easier to understand and navigate. You can click on selected areas of the new SmartDesk, a graphical representation of an office, to access program areas, or you can use pull-down menus or the customizable toolbar. On the down side, this new interface slows down operations considerably—even on a 486/66.

Had MECA produced a Windows version of MYM three years ago when its competitors first rolled theirs out, it might well have been the product to beat in 1995. Still, both versions of MYM remain among this genre's most all-encompassing titles—capable of handling tasks ranging from simple checkbook management to tax and financial planning and sophisticated investment management.—*Kathy Yakal*

▶**Managing Your Money for DOS, Version 11.0; Managing Your Money for Windows, Version 2.0.** MECA Software Inc., *55 Walls Dr., P.O. Box 912, Fairfield, CT 06430-0912; 800-537-9993, 203-256-5000; fax, 800-944-6322.*

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Microsoft Corp.

• Microsoft Money

Microsoft Money, Version 3.0, is an eclectic combination of personal finance software's past and future. The package's core features haven't yet caught up with Quicken or Managing Your Money, but Money is quite proficient at basic financial management: bank account management, budgeting, and reporting.

The package's built-in tax forecasting and investment tracking also lag behind the leaders, but Microsoft's pioneering work in on-line banking makes Money a potentially powerful launchpad for electronic interaction with financial institutions. (Microsoft already has formed partnerships with four regional banks.) No-brainer help tools like Transaction Cue Cards and Financial Wizards make it a good package for novices, and at $14.95 (until January 31, 1995; $24.95 thereafter) it's one of the best buys in this group. Due to the recent proposed merger between Microsoft and Intuit, however, Money is slated to become a member of Novell/WordPerfect's MainStreet product line.

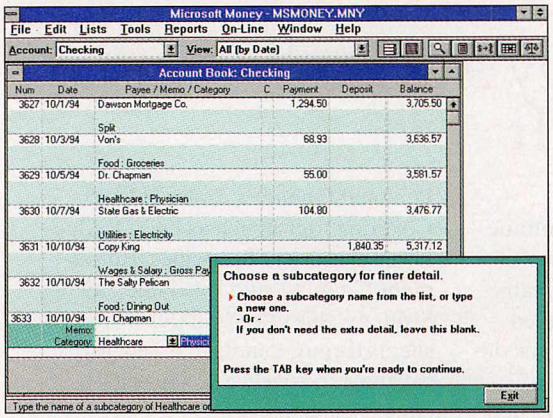
GETTING STARTED

Setting up accounts in Money is a snap: Create at least one account by designating a name and an opening balance and you can enter transactions immediately. Where most products offer several sets of transaction categories (such as home or business), Money offers only one—but it's a good starting framework that can be modified easily.

Fill in the blanks within an account register or form (check, deposit, transfer, and so on) to complete a transaction, and use the split transaction window to allocate income or expenses to different categories. The package can memorize transactions and schedule reminders, and its drop-down lists simplify data entry. If you get lost, the Transaction Cue Cards will step you through the process.

MONEY ON-LINE

Money lets you print checks either as you complete them or later. If you subscribe to Microsoft's Pay On-Line, however, you won't have to worry about printing checks at all; you can simply pay bills electronically. The latter option simplifies reconciling statements, though manual reconciliation is also easy.



Microsoft Money's Transaction Cue Cards add an extra layer of help, aimed mainly at new users.

For customers of four regional banks—Chase Manhattan, First National of Chicago, Michigan National, and U.S. Bank—Money's Bank On-Line service offers 24-hour at-home access to checking, savings, and credit card account information.

REPORT CARD

Although Money's roster of reports isn't as complete as those of most of its competitors, you can create and customize eight standard financial reports (such as Transaction, Income and Expense, and Budget) and five investment-related analyses. You can also easily generate charts from most reports.

SUITABILITY TO TASK

Microsoft Money

	Power	Ease
Checkbook management	GOOD	GOOD
Budgeting	GOOD	EXCELLENT
Tax and financial planning	FAIR	GOOD
Portfolio management	FAIR	GOOD
Electronic connections	GOOD	GOOD

Categories are linked to tax forms and schedules, so you can view a running tally of tax-related income and expenses and export them to a tax-preparation program as a .TXF file. But Money does not offer any tax forecasting or planning features.

FAST TRACKING

The on-board investment-tracking features in Money are adequate for basic account management: You can create accounts and track transactions in mutual funds, Money Market Funds, CDs, stocks, bonds, and discounted bonds.

If you have nonfinancial investments such as real estate, valuable collections, and personal property, they must be tracked as assets. Individual investment accounts can be established to track multiple investments purchased through brokerage houses and banks.

For more precise tracking, the Quotes On-Line feature gives you access via modem to the latest closing price information on more than 16,000 stocks and mutual funds on NYSE, AMEX, and NASDAQ. Money works well as a simple investment record-keeper, though its analysis and advice can't match Managing Your Money's.

Money's Wizards—Savings Calculator, Retirement Planner, Interest Estimator, Loan Calculator, and Mortgage Planner—go a step beyond other programs' financial calculators in helping plan for the future. Each walks you through a step-by-step process, asking questions, expounding on concepts where necessary, and explaining the results.

Microsoft Money's core features and growing outside extensions make it quite a bargain. But if you want a product with more fully developed internal features that offers better guidance, reporting, and analysis, Managing Your Money or Quicken is probably a better choice.—*KY*

▶**Microsoft Money, Version 3.0.** Microsoft Corp., *One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080; fax, 206-936-7329.*

Circle 446 on reader service card

Parsons Technology

• MoneyCounts for DOS
• MoneyCounts for Windows

Millions of PC users have embraced personal finance programs because of their familiar checkbook metaphor and because they use single-entry rather than the more complex double-entry accounting system. Parsons Technology's $29 Money-



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CIRCLE 056 ON READER SERVICE CARD

Counts (Version 8.0a for DOS or Version 8.0b for Windows) is the exception: It uses double-entry methodology behind the scenes but looks like a single-entry system on the surface. This provides both easy operation and powerful, flexible reporting.

MoneyCounts' still-maturing feature set and dearth of on-line help, financial advice, investment-tracking, and program guidance make it no rival for Quicken or Managing Your Money. On the other hand, for a rock-bottom $29 you get capable checkbook management, budgeting and reporting, simple investment tracking, and helpful tax-planning tools.

FIRST STEPS

Setting up MoneyCounts could be easier: The program doesn't come with sample data, on-screen coaches, or a built-in tutorial (though one is available as an add-on). But the slim documentation and context-sensitive on-line help (much fuller in the Windows version) will probably get most users safely through the process.

MoneyCounts offers five sample Charts of Accounts—home, business, farm, church, and rental property—more than its competitors. But unlike other personal finance programs, which distinguish between *accounts* (checking, credit cards, assets, and so on) and *categories* (utilities, groceries, insurance, and so on), MoneyCounts treats all of these as *accounts* and does not allow you to set up subaccounts. You can add new accounts and establish account *groups* to link related income and expenses for reporting purposes, but your groups will not appear as such in your Chart of Accounts. The not-for-profit option lets you set up a fund accounting system, something generally only accommodated easily by business accounting programs.

When entering transactions, you use either the check register or a separate form. The program has standard data entry aids such as automatic fill-in and pop-up lists, and you can split transactions and establish automatic transactions for regular payments or deposits. Checks can be printed immediately or posted and printed later (with or without affecting the balance immediately).

WHAT COUNTS

Because MoneyCounts records a double-sided transaction for every entry, your reports are likely to be more com-

SUITABILITY TO TASK

MoneyCounts for DOS

	Power	Ease
Checkbook management	GOOD	FAIR
Budgeting	GOOD	FAIR
Tax and financial planning	GOOD	FAIR
Portfolio management	GOOD	FAIR
Electronic connections	FAIR	FAIR

SUITABILITY TO TASK

MoneyCounts for Windows

	Power	Ease
Checkbook management	GOOD	FAIR
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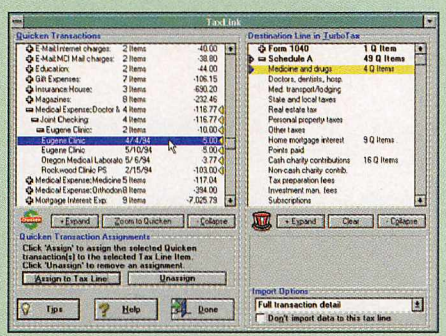
Moving Money for April 15

By Gregg Keizer

While personal finance managers don't yet fill out tax forms, they can speed up that process for you by moving existing data into a tax preparation program's forms and schedules.

Personal finance programs track income and tax-related expenses through *categories*, the grouping labels you can assign to your daily transactions. You can designate a category as tax-related and, in most packages, tag it to a specific line on the IRS form or schedule. These tax-related expenses and income then appear on the tax summary reports each of these programs generates. If you're filing on paper forms, simply copy those numbers into the proper places; if you're using a tax preparation program, you can import that data from the personal finance program.

Personal finance managers typically export tax data as a .TXF (Tax eXchange Format) file, a standard format that all tax prep programs support (although TurboTax grabs numbers directly from Quicken files). After they're imported into the tax preparation program, the numbers reach the appropriate form or schedule, where they can be modified manually. If you later uncover additional deductions or income, however, you usually have to add them yourself to the on-screen tax forms or rerun the import.

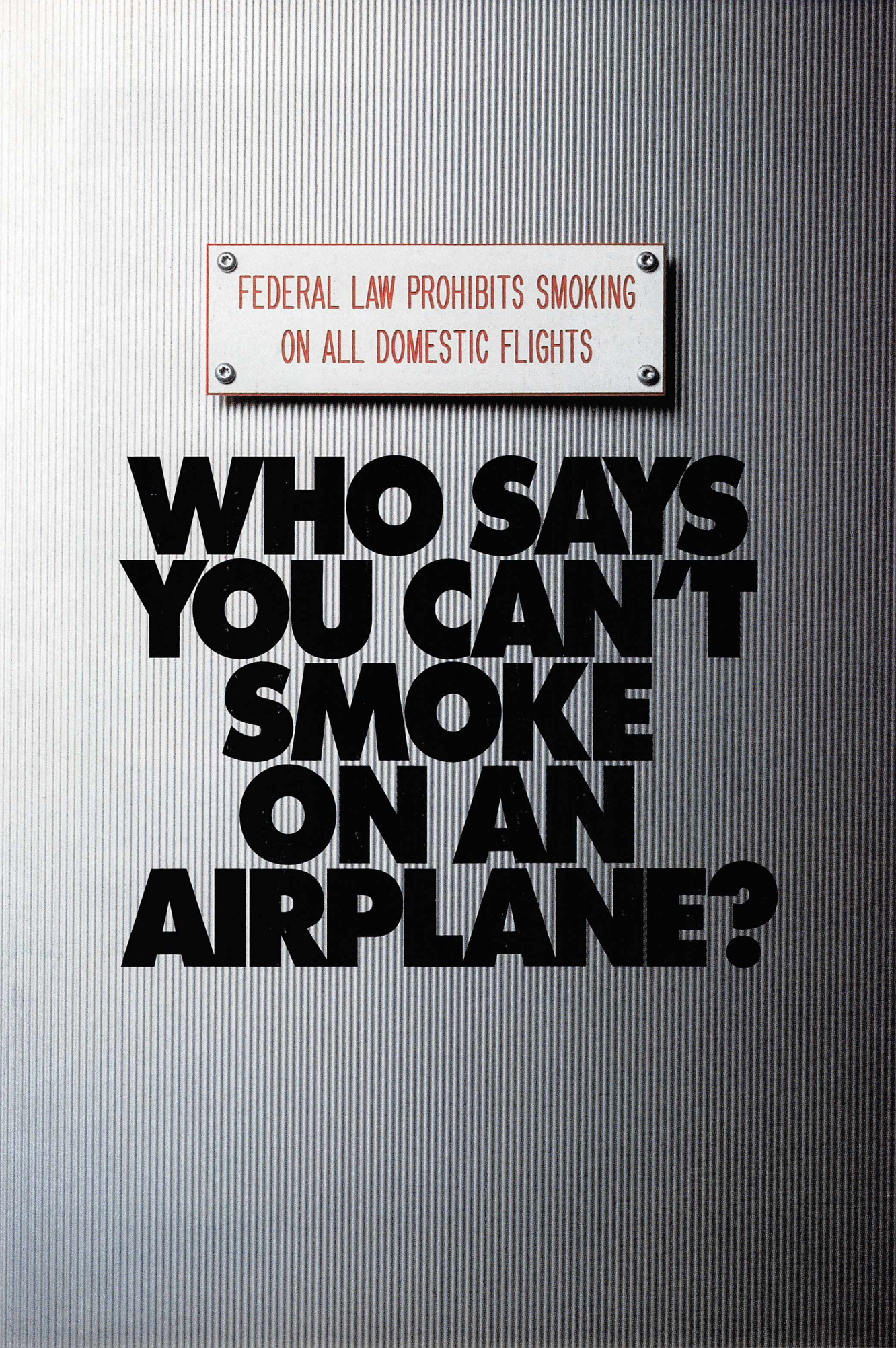


TaxLink lets you change tax relationships or delve into Quicken's data.

BREAKTHROUGH

This is why the link between Quicken for Windows 4 and this year's TurboTax is so impressive. Even after importing Quicken data into TurboTax, you can access information in the former through the latter and vice versa.

A button in TurboTax calls up Quicken data and opens TaxLink—a double-sided view of all transactions, tax-related or otherwise. You can easily reassign a category's or an individual transaction's tax status, add new transactions within Quicken, or modify existing transactions. When you're through, the values are automatically updated within TurboTax. It essentially amounts to having a dynamic, always-available, endlessly repeatable importation process. □

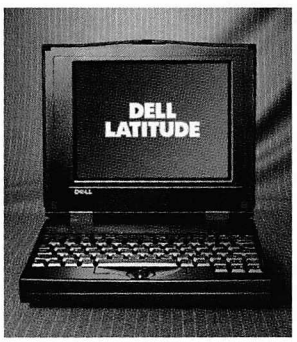

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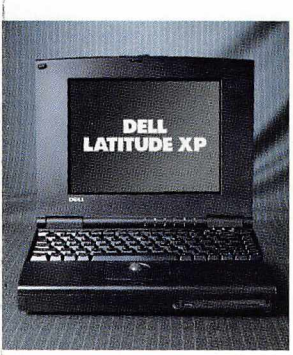
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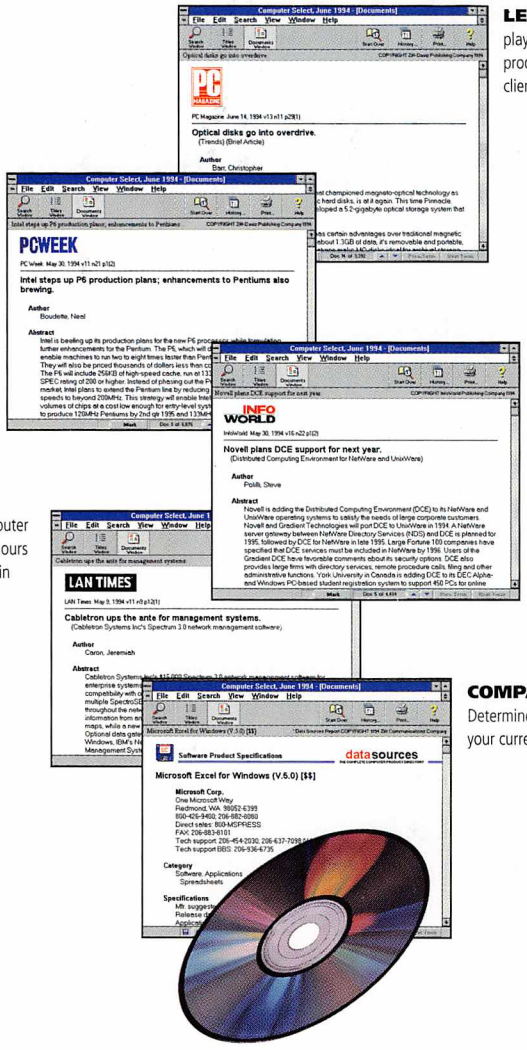
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plete and detailed than with a single-entry product. Customization options, too, are generous. MoneyCounts keeps a General Ledger and generates a Trial Balance—business-style reports that aren't possible with single-entry checkbook programs.

If you've linked accounts to specific IRS forms and schedules, you can run MoneyCounts' Tax At A Glance and view a 1040 form with projected results. The more detailed your budget, the better picture you'll get of your upcoming tax obligation.

MoneyCounts would be a more formidable contender if its financial guidance and investment tracking were stronger. The Windows version offers an on-line accounting guide that has general background about accounting procedures and concepts but no advice beyond that, and each investment can be tracked only as another kind of account (with its own set of reports and graphs).

The attempt to accommodate business users with double-entry accounting is admirable, but MoneyCounts doesn't offer any other built-in business aids. Though MoneyCounts falls substantially short of products like Quicken, its $29 price tag may appeal to users who need only competent banking, budgeting, and tax preparation tools.—*KY*

▶**MoneyCounts 8.0a for DOS, MoneyCounts 8.0b for Windows.** Parsons Technology Inc., *One Parsons Dr., P.O. Box 100, Hiawatha, IA 52233-0100; 800-223-6925, 319-395-9626*

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Intuit Inc.

● Quicken for DOS

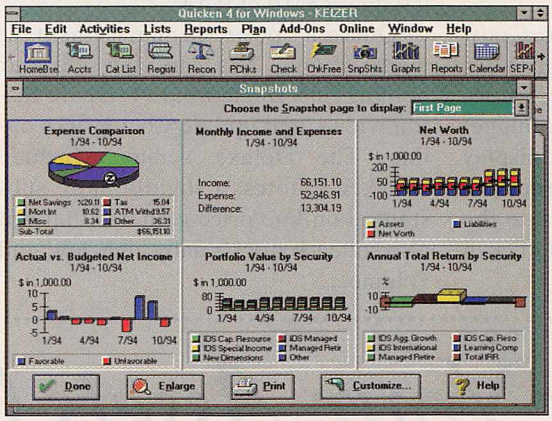
PC MAGAZINE EDITORS' CHOICE

Quicken for Windows

October 1994 was a big month for Intuit: First it released Quicken 4 for Windows and Quicken 8 for DOS, then it turned around and announced plans to join forces with Microsoft Corp. Mergermania aside, the new Quickens ($49.99 each) build on the success of their forebears (both Editors' Choices last year), adding a tax planner, a graphical one-stop-shopping look at finances, and other enhancements to an already solid core. Though evolutionary, not revolutionary, this year's offerings from Intuit constitute a strong follow-up.

QUICKEN COUSINS

The two Quickens share a name and, to a large extent, a feature set—but thanks to its graphical approach, the Windows version is superior in both operation and presentation. Windows *versions* is more accurate, since there are four to pick from:



Quicken 4 for Windows' Snapshot displays up to six graphical financial indicators for an instant Big Picture.

Quicken 4 for Windows on either disk or CD-ROM and Quicken 4 Deluxe for Windows (which tosses in extra financial tools), again on either medium.

Though the multiplicity of Quickens may be confusing, all are easy to set up—the Windows versions particularly so. They walk you through an interview, help you create three basic accounts, and present a Home Base menu that groups money chores by subject. You can avoid the toolbar and launch into specific tasks after scrolling through Home Base's short lists.

Intuit has improved the register portion of Quicken's well-established checkbook metaphor: The Windows versions let you click through your various accounts from a single register (as does Managing Your Money), while a tabbed file-folder interface groups accounts by type.

Quicken can memorize transactions, slap a supergroup class atop a transaction category (to separate family from business, for instance), and perform find-and-replaces across accounts. All versions provide a calendar for scheduling future transactions (in Windows you can drag payments from a list and drop them atop the correct date) and let you reconcile accounts by quickly ticking off returned checks and deposits. Unfortunately, Quicken doesn't uncover reconciliation problems, such as transposed digits.

Quicken's CheckFree link lets you pay bills by modem and make specific transaction inquiries via e-mail. The program's check printing is just as capable: You can adjust the position of the check and print wallet-, voucher-, or standard-size checks.

SUITABILITY TO TASK

Quicken for DOS

	Power	Ease
Checkbook management	GOOD	GOOD
Budgeting	GOOD	GOOD
Tax and financial planning	GOOD	GOOD
Portfolio management	GOOD	GOOD
Electronic connections	GOOD	GOOD

SUITABILITY TO TASK

Quicken for Windows

	Power	Ease
Checkbook management	EXCELLENT	EXCELLENT
Budgeting	GOOD	EXCELLENT
Tax and financial planning	GOOD	EXCELLENT
Portfolio management	EXCELLENT	EXCELLENT
Electronic connections	GOOD	EXCELLENT

THE BIG PICTURE

Quicken's easily customizable reports and charts are among the best in the business. You can drill down to underlying data, as well as build instant reports from any register or transaction. The Windows versions provide more informative charts and can graphically show account trends within the financial calendar. One of Quicken's new features, Snapshot, uses up to six miniature panels to report on such things as net worth, portfolio performance, and savings, thereby giving you an excellent financial Big Picture.

But Quicken's most important addition is Tax Planner, which automatically collects data from tax-related categories.

Essentially the same module offered in last year's Quicken Companion, Tax Planner can create up to three "what if" scenarios and (like other personal finance programs) establish relationships between categories and specific lines within IRS forms and schedules. Quicken Deluxe includes Tax Link Assistant, a program that lets you make global changes to those relationships in a single window.

Quicken's budgeting features now offer user-defined supercategories for simpler monitoring and comparisons. Although Quicken can build a budget from existing data, it cannot display more than a year's worth of information. For a longer-range picture, turn to the forecasting tool found in all the Quicken versions.

MULTIMEDIA TALKING HEADS

Though all the Windows versions share core components, Quicken Deluxe ($69.99) includes several extras (some appropriated from Quicken Companion), such as a home inventory module. The CD-ROM edition layers on several multimedia financial tools, including a talking heads presentation of general financial advice. Though worth the additional $20, it requires 8MB of RAM.

Quicken's portfolio management remains strong. You can view all your holdings in a single window, create custom views, and update stock prices on-line. The Deluxe versions include Quicken Quotes, a slightly more substantial on-line price gatherer that can also collect a stock's daily high, low, and volume.

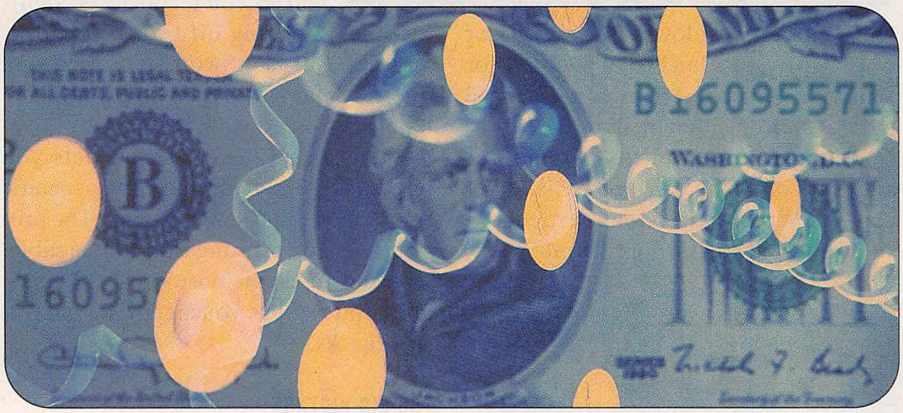
Other Quicken extras range from its Intellicharge Visa or MasterCard (the only nationally available credit cards that deliver statements electronically) to a new savings-goal module that "hides" money you want to set aside for a major purchase.

Quicken 8 is a more-than-capable DOS personal money manager. But the real winner among these packages is Quicken 4 for Windows. By adding such functions as tax planning while maintaining its admirable ease of use, it remains the jewel in the Intuit crown. —*GK*

▶ **Quicken 8 for DOS, Quicken 4 for Windows.** Intuit Inc., *155 Linfield Ave., P.O. Box 3014, Menlo Park, CA 94026-3014; 800-624-8742, 415-322-0573.*

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Putting Your Assets On-Line



Advances in telecommunications make computer-based portfolio management the streamlined way to go.

By Theresa W. Carey

Illustration by Douglas Levere

The personal finance programs in the first part of this story help you keep track of your net worth, but they're not much help when it comes to increasing it. We devote this section to programs that help you manage and nurture your investments via computer and modem.

The programs we highlight here cover four basic investment-management tasks. Fidelity On-line Xpress 2.1, MetaStock for DOS 4.5, Reuters Money Network for DOS 2.0 and for Windows 2.0, StreetSmart 1.0, and WealthBuilder 3.12 for DOS and 4.0 for Windows execute trades on-line. MetaStock, Money Maker 2.0 for Windows, and Windows on WallStreet 2.1 help you with technical analysis. MetaStock, WealthBuilder, and Windows on WallStreet advise you on what to buy and sell. All but Windows on WallStreet track your portfolio by means of reports and graphs.

COUNT THE WAYS

Investors use two methods to decide which securities to add to their portfolios. The first, *fundamental screening,* evaluates basic performance statistics such as one-, three-, or ten-year rates of return to see which securities perform better or worse than the market as a whole. The other is *technical analysis,* in which a security's price and volume patterns are scrutinized and modeled to predict future prices.

Money Network and WealthBuilder share fundamental screening databases that are updated monthly. MetaStock, Money Maker for Windows, and Windows on WallStreet all assist in defining trading systems calculated using technical analysis techniques. Which system is for you? It depends on your level of fa-

miliarity with investing and on how often you plan to trade. Generally, investors looking for long-term holdings rely primarily on fundamental analysis; those who do numerous short-term trades prefer technical analysis.



For active investment guidance:

- **WealthBuilder 3.12 for DOS, WealthBuilder 4 for Windows**

For technical analysis:

- **Windows on WallStreet, Version 2.1**

Keeping the multifarious needs of the "average" investor in mind, we award Editors' Choices to two programs that perform very different tasks. WealthBuilder, from Reality Online, does a terrific job of guiding users through investment decisions and adds on-line research and trading capabilities.

The newly released Windows version of WealthBuilder is very easy to use, extremely customizable, and includes all the extensive research capabilities of Reuters Money Network, which is also a fine package. Money Network gives you access to several on-line financial databases and generates a personalized financial newspaper that will put you well on your way to being a more savvy investor.

Though WealthBuilder doesn't have the technical-analysis prowess of MetaStock or Windows on WallStreet, it does have some good filtering capabilities. And these can help investors make good choices over the medium or long term, which is what many people want. The other programs that offer research or portfolio management just don't put it together as well as WealthBuilder does.

For the active investor in search of analysis, Windows on WallStreet, from MarketArts Inc., is a terrific tool. It's a cinch to install, so you can get into creating your own trading system quickly.

You can start out using the package's built-in trading indicators, then easily develop and track your own as your investment savvy increases. This program is designed to grow with you, a real plus.

WOW is not a portfolio manager, though, so you'll have to keep tabs on your trades in another package. MetaStock, from Equis International, is an incredibly powerful technical-analysis program—but it requires an add-on program to update your research database on-line.

GETTING IT ON-LINE

The programs reviewed here all make use of data found on-line, either on public services like CompuServe and Prodigy or on proprietary services. If you've got a CompuServe or Prodigy account already, there's quite a bit of information you can tap into right now. On CompuServe, for example, you can get basic quotes, check into *Money* magazine's FundWatch, peek at company profiles, and look up ticker symbols without incurring additional charges above the basic services fee of $8.95 a month.

For an extra hourly charge, you can delve into historical security prices, look up annual reports and SEC filings, trade on-line, and interact with fellow investors on the Investor's Forum (GO INVFORUM). You can also trade on-line on CompuServe by setting up an account with one of the companies offering their services in the Electronic Mall. But check out the surcharges carefully before you start cruising: A quick test of the on-line capabilities of one program in this roundup resulted in over $600 in on-line fees.

Prodigy also delivers quotes via Dow Jones News/Retrieval, an on-line version of *Kiplinger's Personal Finance Magazine,* and financial updates such as Market Close. For additional fees, Prodigy members can access Tradeline Performance History, download data or view charts on-line, and carry out trades on-line via the PC Financial Network. To compare notes with other investors on Prodigy, just JUMP over to Money Talk.

Financial data has even found a home on the Internet. Quote.Com, accessible using Mosaic (URL *http://www.quote.com/),* telnet (telnet quote.com), or FTP *(ftp.quote.com),* was the first Internet site to collect data for those needing financial news. A few items are free, such as symbol searches and a limited number of quotes per day, but the remainder incur monthly charges. For $9.95 a month, Quote.Com will update your portfolio of up to 50 items by sending you e-mail with pricing and trading alerts. You can also access Business Wire ($9.95 a month) and other news services. There's even an on-line charting service for World-Wide Web browsers. Up to 50 charts a day can be retrieved for $9.95.

BEING YOUR OWN BROKER

Investors who want to make their own decisions and their own trades can establish trading accounts with one of the companies offering this service, bypassing brokers entirely and thereby saving some money (usually 10 percent or more) in brokerage fees.

It takes a bit of advance planning to get an electronic trading account set up. You'll have to do some paperwork and perhaps put up some collateral before you can actually make on-line trades, but once you're in business, the convenience is remarkable: You can set up buy and sell orders from your PC—ending broker phone tag forever. You won't, however, be able to slip an order in quickly in the middle of a frantic trading day any faster than you would via human being. On the other hand, if you set up your trades outside business hours, they'll be entered at the beginning of the next trading day.

If you play your electronic investments right, your portfolio can earn enough to finance your next computer system, as well as your retirement.

Fidelity Investments

• Fidelity On-line Xpress

ALL REVIEWS BY
THERESA W. CAREY

Fidelity On-line Xpress, Version 2.1 ($59), is a workmanlike DOS program that allows Fidelity customers to make trades electronically and update their portfolios on-line without paying a monthly fee. Developed by MECA Software, Fidelity On-line Xpress (FOX) does the job, but not spectacularly: Trading and portfolio management services are adequate, but FOX offers little investment analysis.

You'll need an established Fidelity account before installing FOX, since part of the startup procedure involves dialing into the database and defining your account. The program's installation routines are not rich in creature comforts. For example, you'll have to look up and enter the access network's phone number manually, modem diagnostics aren't included, and the modem initialization string is hard-coded into the communication routines. Be sure to save the setup data before going on-line; if you crash, you must reboot your computer and reenter all phone number and modem setup information. The on-line help is limited, so you may have to contact the FOX technical support crew if you have problems during setup.

Once you log on to the Fidelity database, your account information is automatically updated, and you can easily view reports showing what's in your portfolio. FOX doesn't link directly to any personal finance package, but the manual details how to send current securities pricing data to Managing Your Money.

Executing trades is at the heart of FOX. You prepare your order off-line and are given several opportunities to review and edit it before completing the transaction. Or you can trade in batch files and work on-line with the Turbo Trader feature.

FOX has easy access to Fidelity mutual funds, which are maintained in a Fidelity Mutual Fund Account. To trade in stocks, bonds, options, and non-Fidelity mutual funds, you can set up a Fidelity Ultra Service Account. FOX can track transactions by tax category, which should make your Schedule D a little easier come April.

If you don't have Managing Your Money but want some analysis, the software for a service called Telescan is included in the FOX box. You pay a monthly fee to use Telescan, and it's integrated with the FOX menu. You can also use FOX to launch S&P MarketScope and Dow Jones News/Retrieval.

SUITABILITY TO TASK

Fidelity On-line Xpress

	Power	Ease
Setup	FAIR	POOR
Information gathering	GOOD	GOOD
Analysis	GOOD	FAIR
Trading	GOOD	FAIR

Though it's not pretty, FOX does a decent job of keeping Fidelity accounts updated and gives you access to quite a bit of information about Fidelity mutual funds. If you've got a Fidelity account already, FOX is a good investment. Fidelity plans to release a Windows version in 1995.

▶ **Fidelity On-line Xpress, Version 2.1.** Fidelity Investments, *82 Devonshire Street, Boston, MA 02109; 800-544-9375.*
Circle 449 on reader service card

Suitability to Task: On-Line Investment Software

Today's investment software can free you from relying on a high-powered broker for your investment decisions. With the help of these packages, you can play the market yourself. In our first-ever roundup of on-line investment software, we found that the feature sets of the packages were quite varied and that most packages do not provide on-line trading. For these Suitability to Task ratings, *power* scores reflect the depth of features available; *ease* scores reflect the product's ease of use as well as its ease of access to on-line services.

SUITABILITY TO TASK

Product Name

	Power	Ease
Setup	EXCELLENT	POOR
Information gathering	GOOD	FAIR
Analysis	FAIR	GOOD
Trading	POOR	EXCELLENT

N/A—Not applicable: The product does not have this feature.

All these packages allow you to access infomation over a modem, but **setup** can be complicated. We rate how difficult or easy it is to get a product up and running.

Comprehensive **information gathering** is absolutely necessary if you expect to make a sound investment decision. When scoring products in this category, we look at both the number of information sources provided by each package and the diversity of data within those sources.

Once you've got the information, it's time to make a decision. Packages that receive extra points in the **analysis** category provide strong features to help you better understand the impact of various factors on current and future investments.

Now you're ready to put your money where your modem is and attempt some securities **trading.** Programs that score well here let you trade on-line and will automatically update portfolio values.

Equis International Inc.

• MetaStock for DOS

Do you want to perform complicated, in-depth technical analysis when making an investment decision? Do you have some cash to sink into the purchase of a program and some time to invest in setting it up and figuring it out? If so, MetaStock for DOS, Equis International's investment program, is the analytical partner for you.

You'll need the add-on Pulse program to manage and analyze your portfolio, since MetaStock's sole purpose is securities analysis. And for full bidirectional information exchange, you'll need The Downloader—an add-on that grabs quotes on-line. These services aren't cheap: MetaStock comes in an "end-of-day" version for $195 and a "real-time" version for $495. Pulse is $195 and The Downloader, $99. If you need the power, though, this may be the right combination for you.

Why? For starters, MetaStock goes far beyond the analysis possible in the other programs in this roundup. It has more than 80 predefined trading indicators, ranging from the Accumulation Swing

Index to the ZigZag. If you don't know how a particular indicator is defined or how to use it, the program's documentation and on-line help tell you all about it. And if you want a customized indicator, MetaStock helps you develop the formula, letting you know if you've made an error and suggesting ways to correct it. You can even incorporate some predefined indicators into your custom formula.

MetaStock by itself is ideal for investors who like to delve into available data to develop and optimize a trading system. You can set up the program to test combinations of securities automatically against groups of indicators. During installation, MetaStock provides you with data for roughly 50 securities so you can see how the program works right away. You can add your data manually or grab it on-line with Pulse or The Downloader.

COMPLETE THE SUITE

The Downloader gives you access to five investment-data vendors and lets you collect end-of-day trading data. Still, you need an account with at least one vendor to log on. You can analyze data in MetaStock, but the programs are not well integrated: You must quit The Downloader to use MetaStock, and vice versa.

The add-on portfolio management program, Pulse, has comprehensive reporting features, can manage up to 75 real or hypothetical portfolios, and can get you on-line—but it is somewhat dated. Released in 1991, the program has a maximum transmission rate of 2,400 bps, an outdated interface, and a difficult menu system. Equis has announced the impending release of Windows versions of both MetaStock and on-line in January 1995.

Equipped with powerful investment features and analysis tools, MetaStock and its add-ons are worth the price for the sophisticated investor who is well versed in the stock market. But the investment novice may find this suite overwhelming in terms of money, time, and resources.

SUITABILITY TO TASK

MetaStock for DOS

	Power	Ease
Setup	FAIR	FAIR
Information gathering	EXCELLENT	GOOD
Analysis	EXCELLENT	GOOD
Trading	N/A	N/A

▶ **MetaStock for DOS, Version 4.5** Equis International Inc., *3950 South 700 East, #100, Salt Lake City, UT 84107; 800-882-3040, 801-265-8886; fax, 801-265-3999.*
Circle 450 on reader service card

Q-West Associates

● Money Maker for Windows

Money Maker 2.0 for Windows ($79.95), from Q-West Associates, offers a sizable collection of investment tools, but there's a catch: The tools are spread across three different programs—Analyzer, Portfolio, and Chart. Why the programs are split up this way is not immediately evident, and the package's functionality suffers considerably from the organization.

The Analyzer program includes several dozen calculators, some of which are not found in other programs at this price level, but their design doesn't take advantage of the Windows interface. Even worse, some sections of the calculators gave wrong answers during testing, including incorrect future value and loan qualification figures. The calculators erase your most recent entries when you close them, so reopening a particular function requires starting over—annoying if you use the more complicated analytical calculators such as stock price forecasting models.

SUITABILITY TO TASK

Money Maker for Windows

	Power	Ease
Setup	FAIR	FAIR
Information gathering	FAIR	POOR
Analysis	GOOD	FAIR
Trading	N/A	N/A

CLOUD WITH A TARNISHED LINING

The second program in Money Maker's trio is Portfolio, which is simple to use and allows you to track as many portfolios as your hard disk can hold. You can't, however, readily compare portfolios or even combine them for reporting purposes.



SUMMARY OF FEATURES

On-Line Investment Software

Products listed in alphabetical order ■ = YES □ = NO	Fidelity On-line Xpress 2.1	MetaStock for DOS 4.5	Money Maker 2.0 for Windows	Reuters Money Network for DOS 2.0, Reuters Money Network for Windows 2.0	StreetSmart 1.0	WealthBuilder 3.12 for DOS, WealthBuilder 4.0 for Windows PC MAGAZINE EDITORS' CHOICE	Windows on WallStreet 2.1 PC MAGAZINE EDITORS' CHOICE
List price	$59.00	$195.00	$79.95	$49.95	$59.00	$99.95	$149.95
General Features							
Interface	DOS	DOS	Windows	DOS, Windows	Windows	DOS, Windows	Windows
Automatic modem configuration	□	□	■	■	■	■	■
On-line trading	■	□	□	■	■	■	□
Quotes							
Bonds	■	■	■	□	■	□	■
Futures	□	■	■	■	■	■	■
Indexes	■	■	■	■	■	■	■
Mutual funds	■	■	■	■	■	■	■
Options	■	■	■	■	■	■	■
Stocks (AMEX, NASDAQ, NYSE)	■	■	■	■	■	■	■
Available via:							
CompuServe	□	■	■	□	□	□	■
Dow Jones	□	■	□	□	■	□	■
Prodigy	□	□	■	□	□	□	□
Dial/Data	□	■	□	□	□	□	■
Marketscan	□	■	□	□	□	□	□
Other services	Proprietary	Signal	None	Proprietary, S&P Comstock Feed	Proprietary, S&P MarketScope	Proprietary	GEnie
Investment Tracking							
Maximum number of portfolios	Unlimited	75	Unlimited	Unlimited	Unlimited	Unlimited	N/A
Maximum number of securities per portfolio	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	N/A
Securities advice	Optional	□	■	■	Optional	■	■
Tax information related to user's trade	■	■	■	■	■	■	□
Automated on-line updates	■	■	■	■	■	■	■
On-line and off-line technical analysis	Optional	■	■	■ ❶	□	■ ❶	■
"Expert system" analysis	□	■	□	■	□	■	■
Ranking by user-specified criteria	■	■	□	■	□	■	■
Can export data to tax preparation program	■	■ (ASCII only)	□	■	■	■	□
Can export data to personal finance program	■	■ (ASCII only)	□	■	■	■	■ (ASCII and MetaStock)
User-definable indexes	■	■	□	□	□	□	■
Hypothetical trading accounts	■	■	■	□	■	■	□
News and Information							
Current financial news	Optional	Optional	□	■	Optional	■	Optional
Financial statements and annual reports	Optional	Optional	□	■	Optional	■	Optional
Estimates and forecasts	Optional	Optional	■	■	Optional	■	Optional
Analyst reports	Optional	Optional	□	■	Optional	■	Optional
Charts and Graphs							
High-low-open-close charts	□	■	■	■	□	■	■
Comparisons to index performance	□	■	■	■	□	■	■
User can chart or graph by history, month, or day	□	■	■	■	□	■	■
User can graph multiple securities simultaneously	□	■	□	■	□	■	■

N/A—Not applicable: The product does not have this feature.
❶ Users can download historical pricing charts and export data to technical-analysis software packages.

You can, of course, manually transfer individual portfolio reports to your spreadsheet for comparison purposes, but that's a clumsy alternative.

You can use either Prodigy's stock quote facility or CompuServe's investment database to update securities prices via modem. You can also enter stock prices manually, although the procedure is rather cumbersome.

Some basic graphics are built into Portfolio, such as displays of investments by type and percentage return, but the more extensive graphing capability is in the Chart program. There you can display pricing data in a number of formats and easily place a moving-average overlay on the graph to perform some rudimentary technical analysis. Only one security at a time can be graphed, though, and you can only track against the Commodity Channel Index, which is relatively obscure.

The manual, which offers such pearls as "The investor worry about the stock price will fall down very soon," needs a thorough edit. The screens and help system also contain numerous typographical

errors. Money Maker contains a few nice touches, such as 3-D graphing capabilities. But it has so many problems that, unless you're desperate for a particular feature, you're better off waiting to see if the publisher fixes them.

▶**Money Maker 2.0 for Windows.** Q-West Associates, *13223 Black Mountain Road, #1-410, San Diego, CA 92129; 800-618-6618, 619-484-6648; fax, 619-484-8606.*

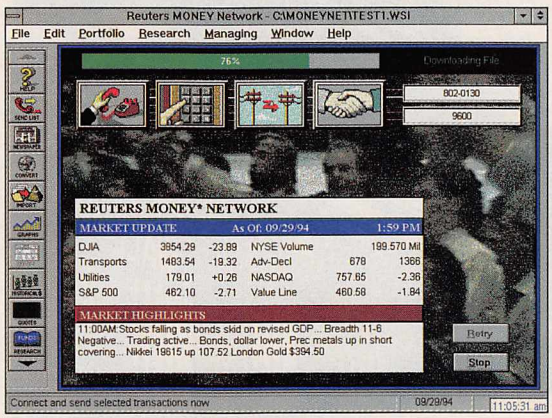
Circle 451 on reader service card

Reality Online Inc.

• Reuters Money Network for DOS
• Reuters Money Network for Windows

Imagine basic, easy-to-use portfolio analysis; a personalized financial newspaper; access to the latest stock prices and financial news; and real-time, on-line trading—in one package. Too good to be true? Reality Online's $49.95 Reuters Money Network (Version 2.0 for DOS and Version 2.0 for Windows) has it all. Clearly more than just the front end to an on-line database, Money Network is a good choice for investors who want an easy, cost-effective way to keep their portfolios updated.

Both versions of Money Network are built in to the respective versions of Reality's WealthBuilder (reviewed separately). The Windows version of Money Network is compatible with Quicken, Microsoft Money, Managing Your Money, and any other financial management program that can export a .QIF file. If you're currently using Quicken or Microsoft Money to manage your portfolio, you can import securities data directly from those programs to set up your portfolio in Money Network. You have to be careful though: The correct ticker symbols must be attached to each security beforehand. Alternatively, you can enter data manually.



On-line with Reuters Money Network: The "ticker strip" across the top keeps you apprised of session progress.

MONEY ON-LINE

Money Network is simple to install and includes 24 modem setup strings. If your modem is not on the built-in list, a call to technical support (open until 11:00 P.M. eastern time) solves the problem.

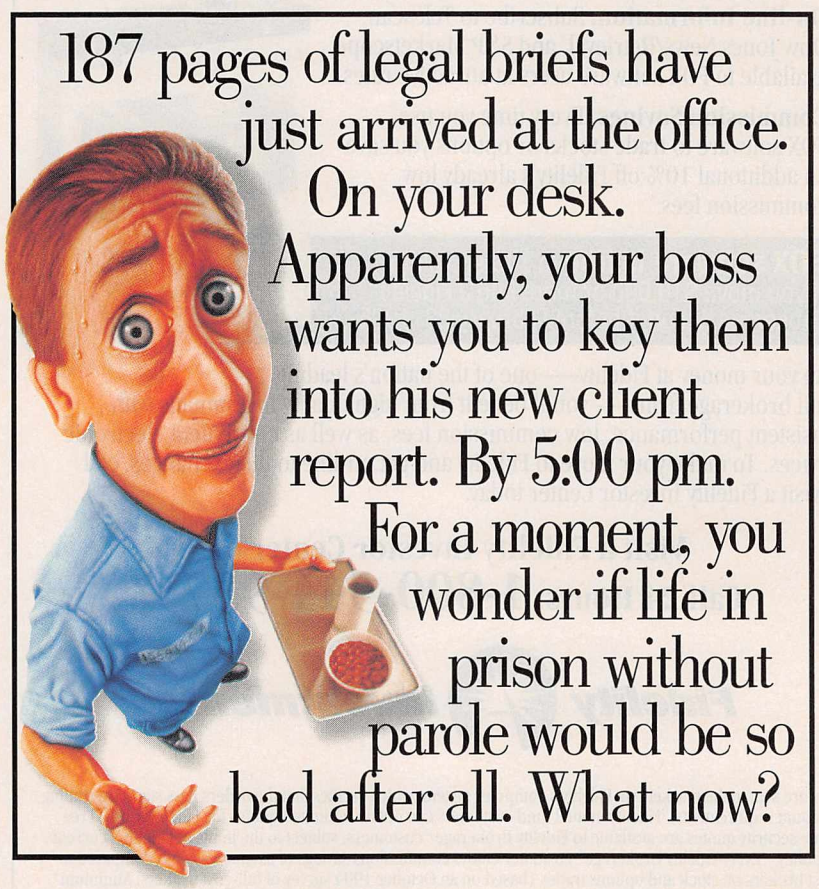
The on-line service itself is free for the first month, after which you pay based on the level of detail you want. The basic service, at $9.95 per month, includes mutual fund, CD, and money market updates, as well as access to on-line trading and automatic portfolio updates. For $17.95 per month you get everything in the basic service plus stock and bond databases. The personalized News Clipping Service will grab up to 1,000 magazine and newspaper articles related to your investment interests for another $6.95 per month.

To get started, complete the 12-step questionnaire that defines your trading profile, then fire up your modem and tap into the database. Logging on is as easy as clicking a button, and the well-designed display keeps you informed of the session's progress. When the session is completed, check your current portfolio value and performance and the news items you've specified by perusing the customized, five-page

SUITABILITY TO TASK

Reuters Money Network for DOS
Reuters Money Network for Windows

	Power	Ease
Setup	GOOD	GOOD
Information gathering	GOOD	GOOD
Analysis	GOOD	FAIR
Trading	GOOD	GOOD

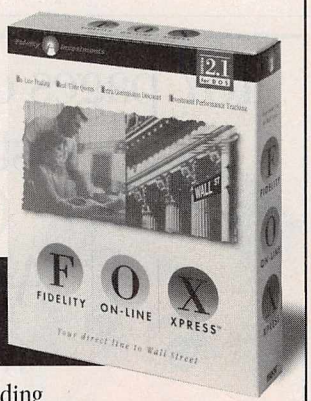




Your Direct Line to the Exchanges

You may not be able to have your own seat on the exchanges, but you can have the next best thing: **Fidelity On-line Xpress℠ (FOX)** software. It gives you:

- **Control.** Trade your own stocks, options, and mutual funds direct to the markets in seconds via Fidelity's computer systems.[1]
- **Convenience.** Access real-time quotes and account information with no monthly fee.[2]
- **On-line Information.** Subscribe to Telescan, Dow Jones News/Retrieval, and S&P Marketscope, available to FOX software users at attractive rates.
- **Commission Savings.** Every time you use FOX software to trade stocks or options you save an additional 10% off Fidelity's already low commission fees.[3]



FOX software is free (a $49.95 value) if you move $10,000 or more into a Fidelity Brokerage Account before February 28, 1995.

With your money at Fidelity — one of the nation's leading retail brokerage firms — you'll benefit from high quality investments with consistent performance, low commission fees, as well as convenient electronic services. To make your move to Fidelity and get on-line to the exchanges, call or visit a Fidelity Investor Center today.

Visit a Fidelity Investor Center or
Call 24 Hours: 1-800-544-9375

Fidelity Investments®

[1]Orders are sent to the markets via Fidelity's computer system, which verifies that the orders pass standard trading and account requirements. [2]Fidelity mutual fund customers can obtain unlimited quotes for Fidelity funds. Free real-time security quotes are available to Fidelity Brokerage® customers, subject to the limits of Fidelity's current quote policy. [3]Every Fidelity Brokerage® customer enjoys commissions savings of as much as 76% compared to full-cost brokers on stock and options trades (based on an October 1994 survey of full-cost brokers. Minimum commission $38.) Savings will vary based on size and nature of trade. Hardware requirements: IBM PC or compatible; hard disk drive, 640K RAM;2400 baud or faster Hayes or compatible modem; any printer and any monitor. Fidelity account required for on-line access. Fidelity Brokerage Services Inc. Member NYSE/SIPC.

CIRCLE 214 ON READER SERVICE CARD

"newspaper" the program builds for you. Most of the program's features can be accessed from the newspaper itself.

If you use Quicken or Money now to manage your portfolio and want basic portfolio evaluation and update capabilities, Money Network is a good choice. The enthusiastic beginner who wants to accurately track and analyze investments while learning more about the stock market will also find this program useful.

▶**Reuters Money Network for DOS, Version 2.0; Reuters Money Network for Windows, Version 2.0.** Reality Online Inc., *2200 Renaissance Blvd., King of Prussia, PA 19406-2755; 800-521-2475, 610-277-7600; fax, 610-278-6115.*

Circle 452 on reader service card

Charles Schwab & Company Inc.

● StreetSmart

StreetSmart ($59) is kind of a one-and-a-half-trick pony: Its raison d'être is letting Charles Schwab & Company's 3 million account-holders do on-line trading, but anyone can use it to get quotes from various on-line services. The program's design is outdated, with buttons scattered randomly on data entry screens and window placement that obscures valuable information. You'll end up constantly moving and resizing report boxes to see the numbers, which are displayed in a spreadsheet-like grid.

We also had some trouble loading StreetSmart during testing. When you load StreetSmart, it automatically installs the TurboComm communication drivers, which are likely to wreak havoc with any other program that uses your modem. Installation of the drivers is the default setting, but we suggest that you avoid it since StreetSmart runs perfectly without them.

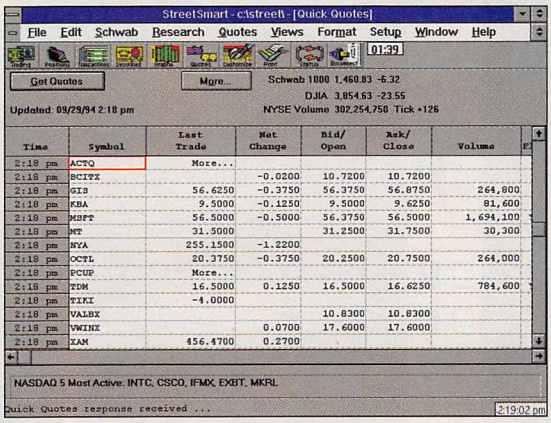
StreetSmart doesn't offer any investment advice as such, so you're on your own when making trading decisions. To make a trade using StreetSmart, you must first

SUITABILITY TO TASK

	StreetSmart	
	Power	Ease
Setup	FAIR	GOOD
Information gathering	FAIR	FAIR
Analysis	FAIR	GOOD
Trading	GOOD	FAIR

have an existing Schwab account that you define during the setup phase. Using the enclosed Stock Guide booklet, you enter the ticker symbol for the securities you want to trade. Set up orders on the Add Orders screen, specifying the action (buy, sell, and so on), the quantity, the price, and the time limit for the order (day only, good until canceled, fill or kill). From there your order goes to the Unsubmitted Orders grid, where you can view and edit it.

StreetSmart displays detailed information about your accounts, such as your overall balance, trade history, and order status. You can also define a list of securities for which you want current price quotes; StreetSmart will then maintain those quotes in a history database.



Retrieving quotes on-line with Charles Schwab's StreetSmart for Windows is simple.

Unfortunately there's no way to define an on-line task list when you want information from the Schwab computer. Logging onto the Schwab network is free, but you do pay for each trade. StreetSmart can also be used as a front end to Dow Jones News/Retrieval and S&P MarketScope, which are available either for an additional monthly fee or on a pay-as-you-go basis.

Since StreetSmart is a front end to a discount brokerage firm, perhaps it's allowed to look slightly frumpy. But Schwab customers used to more sophisticated Windows applications might be better off manually entering their trades using another package.

▶**StreetSmart, Version 1.0.** Charles Schwab & Company Inc., *The Schwab Building, 101 Montgomery St., San Francisco, CA 94104; 800-334-4455, 415-627-7000; fax, 415-403-5503.*

Circle 453 on reader service card

Reality Online Inc.

PC MAGAZINE **EDITORS' CHOICE**

WealthBuilder for DOS
WealthBuilder for Windows

If you like the idea of a personal investment coach helping you handle your portfolio, WealthBuilder, from Reality Online ($99.95), may be just the package for you. It provides investment advice based on *your* financial situation and goals—along with portfolio management.

Although WealthBuilder's financial advice focuses primarily on selecting mutual funds, the package provides information on topics from annuities to stocks. WealthBuilder also encompasses Reuters Money Network, an on-line financial information and trading service reviewed separately in this feature.

During installation, WealthBuilder asks 12 questions that help its WealthAdvisor feature develop your investment strategies. You tell the program your age, feelings about risk, investment philosophy, and favorite types of investments. Sample questions include: "If you won $500 on a bet, would you: A) Pocket the money; B) Go for double or nothing." It then develops a Financial Blueprint and assigns you to one of five possible risk levels.

The questionnaire's main weakness is that it assumes you are knowledgeable about the various sorts of investments. Fortunately, as your knowledge grows, you can go back and amend your profile.

The next step is entering data from your existing portfolio (if you have one), so WealthAdvisor knows what you're working with. This can be tricky unless you follow the setup steps carefully.

First you must define your accounts, keeping the taxable assets separate from tax-deferred to ensure correct reporting. You also need to specify a costing method for each account, which cannot be changed once the setup is complete.

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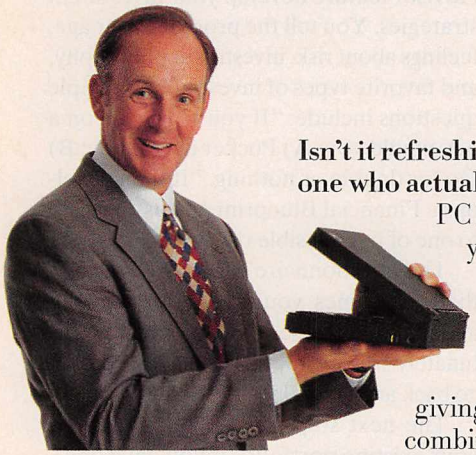


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CIRCLE 292 ON READER SERVICE CARD

A road map for the



Isn't it refreshing to talk to someone who actually listens? At IBM PC Direct™, we'll help you put together the ThinkPad® notebook that's exactly right for you. We call it CustomerFit: giving you the perfect combination of hardware, software, peripherals and accessories. And you can pay the way you prefer. Choose from most major credit cards, 36-month business leasing plans, or purchase orders for qualified customers. Of course, everything you buy is always covered by our 30-day moneyback guarantee.[1]

Start with the ***acclaimed 10.4″ (measured diagonally) color display****. Models available in TFT active matrix, dual scan, or the new glare-resistant black matrix on array TFT color screens.*



The ThinkPad 755 series has been ***hailed by nearly everyone,*** *including* ***PC World*** *and* ***PC Magazine.****

The newest 755 notebooks (like the 755CE) come with an Mwave™ Digital Signal Processor (DSP™) with ***fax, data, telephony and high-quality audio capability****. Plug into the telephone jack and your ThinkPad becomes a speakerphone or even an answering machine with fax-back-on-demand capability.*

A choice of models featuring either the ***Intel® DX4/75MHz or DX4/100MHz*** *processor. Integrated math coprocessor is standard.*

Amid the comfortable full-size keys on the new models is nestled the ***new TrackPoint III™*** *with enhanced "Quick Stop" capability. Say goodbye to messy clip-ons and greasy trackballs.*

An IBM exclusive. The ThinkPad 755 uses ***parity memory****. That means it tells you if there is a data error. If your data is mission critical, this is a must.*

Transferring and synchronizing files and data has never been easier. The new ThinkPad 755 models come with integrated ***infrared capability****. That makes wireless communications with other notebooks and desktops both quick and reliable.*

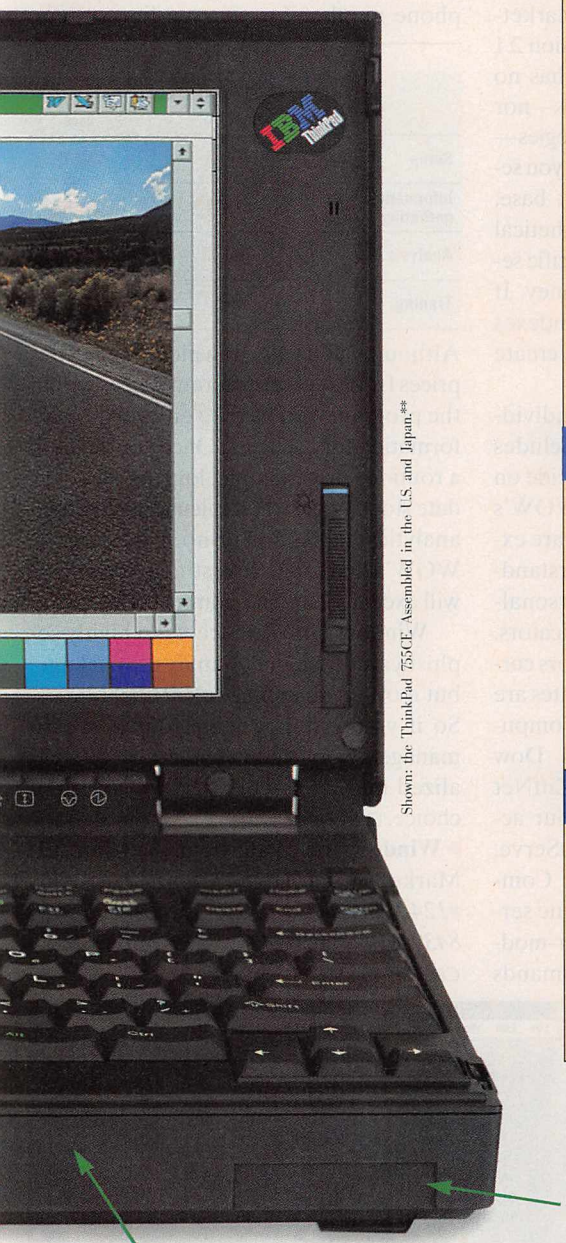
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	Convenient to operate	***Convenient to operate***	***Convenient to operate***
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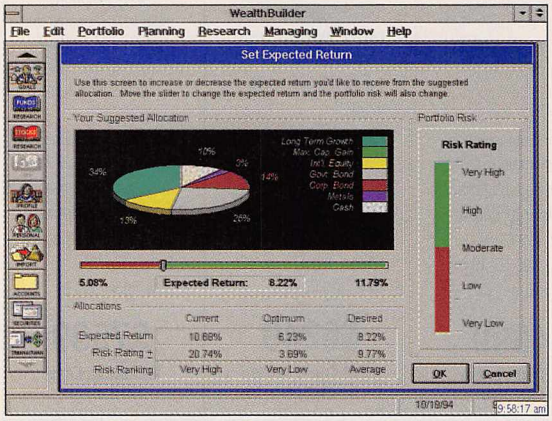
SUITABILITY TO TASK

WealthBuilder for DOS
WealthBuilder for Windows

	Power	Ease
Setup	GOOD	GOOD
Information gathering	GOOD	GOOD
Analysis	EXCELLENT	FAIR
Trading	GOOD	GOOD

Once WealthBuilder is set up, you can invoke WealthAdvisor's expert advice. Using your current holdings and Financial Blueprint, WealthAdvisor recommends specific transactions, which you can conduct through the Money Network.

The Windows version of WealthBuilder ($99.95) was introduced just too late for full coverage, but it does offer some enhancements. You can, for instance, group on-line requests and send them in a batch. This version also makes tweaking your financial profile easier by providing slider bars to adjust your preferred risk level and then automatically recalculate portfolio recommendations.



WealthBuilder lets you use the slider bars on the profile screens to fine-tune your investment blueprint.

WealthBuilder is a well-rounded program for the beginning to intermediate investor. It doesn't offer sophisticated technical-analysis features, but it gives you a good look at your financial situation and helps you set realistic goals. If you're new to the investing game and don't want to deal with a broker's high-pressure sales techniques, WealthBuilder can educate you and guide you along the road to your financial goals.

▶ **WealthBuilder 3.12 for DOS; WealthBuilder 4.0 for Windows.** Reality Online Inc., *2200 Renaissance Blvd., King of Prussia, PA 19406-2755; 800-521-2475, 610-277-7600; fax, 610-278-6115.*

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MarketArts Inc.

EDITORS' CHOICE

Windows on WallStreet

A powerful investment analysis tool that grows with you is what you get in MarketArts' Windows on WallStreet, Version 2.1 ($149.95). Although the package has no portfolio management capabilities—nor does it recommend investment strategies—WOW's analytical features can help you select what to include in your asset base. WOW also lets you set up a hypothetical portfolio to test the behavior of specific securities before you invest real money. If you don't find the usual market indexes helpful, WOW lets you create your own.

Beyond analysis of individual securities, WOW includes indicators to help you decide on buy and sell timing. WOW's manual and on-line help are excellent aids toward understanding how to develop personalized market-tracking indicators.

To keep those indicators current, securities price updates are available on-line via CompuServe, Dial Data, and Dow Jones News/Retrieval. (ZiffNet members, make sure your account can access CompuServe, and add a GO CIS line to the CompuServe log-on macro.) Each on-line service configuration includes ten user-modifiable buttons that execute commands such as logging on to an investment forum. These are handy if you want to do something on-line besides download quotes and news. If you need to enter securities data manually, you can; but if you want to track pricing on a daily basis, you'll spend lots of time typing.

Once a securities data file is set up, the graphic-intensive analysis functions come into play. WOW has more than a dozen predefined graphical templates, and you can easily create new ones such as sophisticated pricing graphs with multiple securities and indexes displayed. Advanced graphical analysis options include moving averages, regression trendlines, Fibonacci and Gann studies, Andrews pitchforks, cycle lines, and others. Charts can be tiled to display several on one screen.

WOW's modem setup includes diagnostics, but you must supply the correct phone number for your on-line system.

SUITABILITY TO TASK

Windows on WallStreet

	Power	Ease
Setup	FAIR	GOOD
Information gathering	FAIR	FAIR
Analysis	GOOD	EXCELLENT
Trading	N/A	N/A

Although you can download securities prices from several different places within the program, you have to enter log-on information for each one. Once you develop a routine—for example, logging on to update stock prices, then calculating updated analytical tables and printing them out—WOW's Personal Investment Assistant will execute it at your command.

Windows on WallStreet is a highly sophisticated technical-analysis package, but it offers no management capabilities. So if you're happy with your portfolio management program and want a personalized market tracker, WOW is a good choice. □

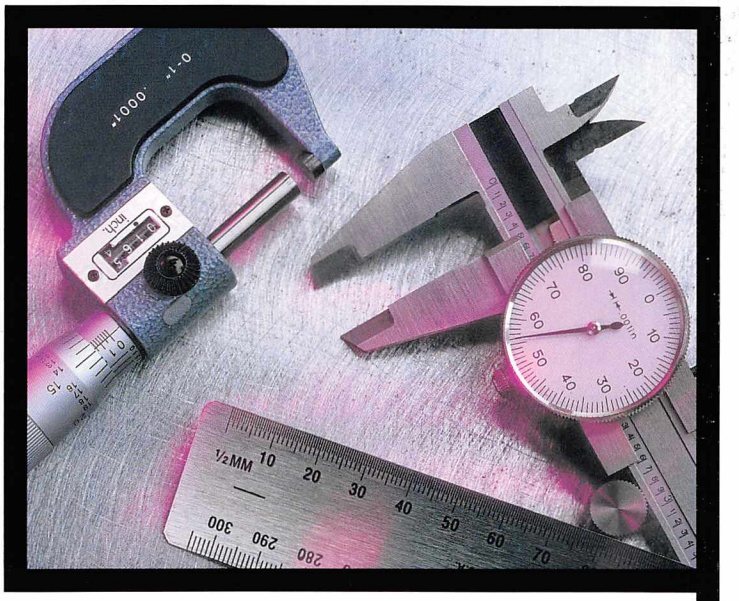
▶ **Windows on WallStreet, Version 2.1.** MarketArts Inc., *1810 North Glenville, #124, Richardson, TX 75081; 800-998-8439, 214-235-9594; fax, 214-783-6798.*

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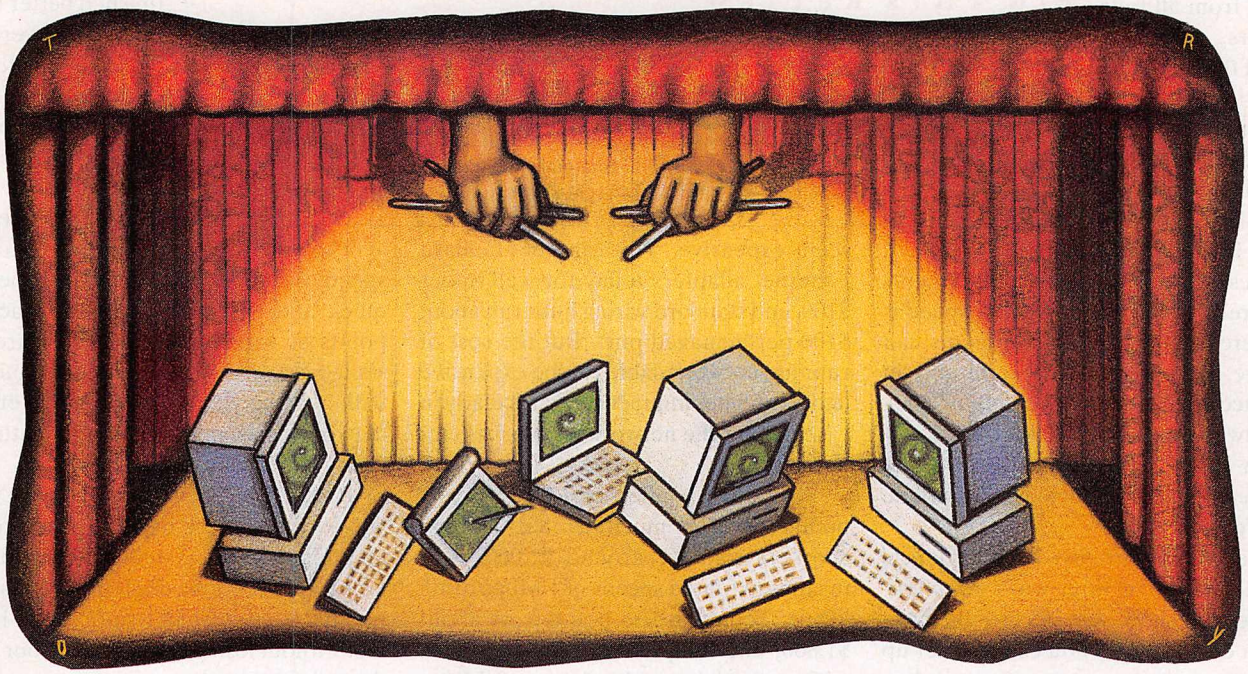
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WIRELESS LANS

No Strings Attached

We like to be mobile—even when we're at the office. Here's a crop of wireless LAN adapters that give fresh meaning to the idea of *roaming* the halls.

By Padraic Boyle

Just about anything that's called "wireless" appeals to users. It sounds like fun. And the very idea of not being tied to a desk in order to work seems to inspire us to be more productive (if only out of gratitude or guilt). But is all that freedom worth the trade-offs? What are the practical considerations of working wirelessly?

With the fresh crop of wireless local-area connectivity products that operate over radio waves, working wirelessly is not as daunting as it used to be. Wireless LAN products used to be too slow, too expensive, and too limited in range to be worth a second thought. This year we found wireless LAN adapters and access points that make offering such options to your users pretty painless.

We review wireless adapters for connecting your PC to the local LAN from AT&T, Proxim, Solectek, and Xircom. All four offer PCMCIA wireless adapters, which are geared to the notebook PC crowd. Solectek also offers a parallel-port version, so you can connect any desktop or notebook system; we reviewed this adapter as well.

The second part of a wireless LAN solution is the access point, the device that establishes the connection between wireless adapters and the wired LAN.

Illustration by Troy Thomas

We reviewed access points from all four vendors. (For an idea of the full range of wireless connectivity, see "The Wireless Spectrum" in this story and "Wireless WAN Gear" in the Trends column.)

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These products are not replacements for wired LAN solutions. Their speed is nowhere near what wired systems can achieve, and potential for interference in an office environment is too great. They do, however, provide another flexibility option that network managers of the 1990s can offer to an increasingly mobile work force.

In addition, wireless LAN products can be deployed in three ways. A *stationary* user can simply connect to the LAN from a desktop PC. You can also set up an impromptu *peer-to-peer* wireless LAN, in a meeting, for example, using popular software such as LANtastic. *Roaming* capabilities are for the user who needs to move from office to office but stay continually connected to the LAN.

PRACTICAL WIRELESS

Convenience aside, you have to look at all the standard considerations: cost, performance, ease of use. Compared with cable-based LAN adapters, these products may seem expensive. You can get standard Ethernet adapters today for well under $100, and standard wiring hubs run about $100 per managed port. But the cost of running network cable can be expensive and sometimes impractical, particularly in cases where the network is only for temporary use.

A year ago, wireless radio LAN access points cost as much as $2,500, and adapters sold for around $1,000, with maximum touted speeds of 1 Mbps to 1.5 Mbps. Today, access points cost about $1,800, and adapters are around $600, with potential speeds of up to 2 Mbps. While wired prices are still much lower, there's no arguing about the luxury of working or playing with no strings attached.

Speed is probably the most dramatic tradeoff. The wireless networks we tested proved to be almost bearable when you're loading programs over the network. All of the manufacturers rated their speeds at 1 Mbps to 2 Mbps, which is well above the throughput we actually observed. AT&T's solution finished better than the others over and over; in fact, its combination of performance and ease-of-use prompted us to designate it our Editors' Choice.

Though wireless systems are not as speedy as their wired cousins, they're quick and easy to install. With access points or wireless adapters that are installed in a server, users can communicate with existing wired networks. An entire network can be put together in a matter of hours rather than days.

Range has been another issue with wireless, but there have been improvements in this area as well. All of the products reviewed showed astounding results, ranging from 400 feet to more than 1,000 feet without losing connection in our outdoor distance test.

TWO APPROACHES

The two technologies most widely used in wireless networking are radio frequency (RF) and infrared. The Ethernet products we tested all use spread spectrum radio. But we took a quick look at some infrared products as well (see the sidebars "Light Show" in this story and "Synchronicity: Notebook to Desktop" in Trends.)

Vendors have been moving towards

HIGHLIGHTS

Wireless LANs

WIRELESS LANS have come a long way over the past year. Using radio-frequency technology, four companies currently offer affordable, easy-to-use wireless LAN solutions that provide acceptable performance for some applications and surprisingly good range. More and more companies are jumping into the wireless arena.

THESE SOLUTIONS WON'T REPLACE your entire LAN system, but they do provide viable solutions for situations in which dealing with cable would prove a real hindrance. The adapters are usually PCMCIA with small antenna boxes that attach to the back of your notebook PC's screen.

ROAMING is one appealing capability. A user can move around the entire office and still stay connected via a wireless adapter that signals to strategically placed "access points." The access points then connect the wireless entities to each other and to the wired LAN. Some wireless products do it better than others. Peer-to-peer arrangements, using popular software, are also possible.

FREQUENCY HOPPING or direct sequence: Each product in this roundup uses one or the other approach to spread spectrum radio technology. During our performance testing, the products that used direct-sequence spread spectrum (DSSS) technology fared much better.

INFRARED TECHNOLOGY is another way to move to a wireless system. We looked briefly at infrared LAN products and a few that specialize in simplifying the synchronizing of files between desktop and notebook PCs.

radio for many reasons. For one thing, radio waves can penetrate walls, floors, and glass, making it a more usable medium in a complex structural environment than infrared. Infrared products are lower priced than RF products and can run at almost the same speed as a wired segment. Still, infrared systems cannot penetrate walls or turn corners; they are not nearly as flexible as RF products.

Two approaches were used to implement spread spectrum radio among the products here: Proxim's RangeLAN2 and Xircom's Netwave used *frequency hopping*. AT&T's WaveLAN and Solectek's AirLAN both employed *direct sequencing*. Our sidebar "Spread the Signal" discusses the two approaches in detail. Among other things, both of these approaches provide for security, another hot-button issue in wireless connectivity. The bottom line in our tests: Products using direct sequencing came out on top in performance and distance.

WHERE THE PC USERS ROAM

Roaming means you can leave your desk with your laptop or pen-based PC and move around the halls and into conference rooms while maintaining connection to the LAN. It is one of the most powerful and appealing features of wireless networking.

As you move around the office, the signal from your LAN adapter may change the access point to which it is transmitting. When a PC detects that the signal is getting weaker and that it is leaving the range of one access point, the adapter polls all the other access points on the network to see which one is closest. Then the adapter transparently switches from one access point to another. Only the Proxim was able to roam without losing connection. Xircom's Netwave, AT&T's WaveLAN, and Solectek's AirLAN/Parallel adapter showed some difficulty moving from one access point to another.

POWER POINTS

Wireless adapters are generally used with notebook and pen-based PCs. Power consumption becomes a big deal, as these devices draw from your system's battery. To help conserve power, AT&T, Proxim, and Solectek all have sleep options that can be configured to shut down the adapter in the event when you're not transmitting or receiving data. The adapter will, however, send a watchdog packet to avoid being disconnected from the network.

If you are using NetWare and installing a wireless network, you should take full advantage of Novell's VLM (Virtual Loadable Module) technology. VLM packet-burst technology increases the adapter's throughput performance. In addition, in a peer-to-peer environment it is important that you increase the network buffers to enhance performance.

Moreover, in connecting wirelessly (as in connecting remotely), you'll note that executable files, such as NetWare's LOGIN.EXE or a word processing package, are slow to start up. If possible, you should try not to run large executables over the wireless network. Copy the executable file beforehand or install the program on your local hard disk to provide better performance. This way only smaller data files will need to be transmitted over the adapter.

Also, when you design a wireless network that encompasses a large area, you need to install access points in such a way that the coverage areas overlap each other to eliminate any dead zones. Proxim and Solectek both offer diagnostic programs that enable you to test the strength and quality of the radio signal between a

PC MAGAZINE EDITORS' CHOICE

• AT&T WaveLAN PCMCIA and WavePOINT

All of the wireless LAN solutions we tested make good on the promise of convenience, and pricing overall was good across the group. The AT&T WaveLAN solution distinguished itself as our Editors' Choice principally because of consistently and markedly superior performance in an arena where performance really matters. The goal is to make it as painless as possible for users to go wireless, and AT&T did that best. (That said, nobody approaches wired speeds—yet.)

The WaveLAN PCMCIA and WavePOINT access point also provided surprisingly good range, maintaining their excellent throughput at 1,000 feet; others failed notably sooner. The Solectek AirLAN, which is built on the AT&T hardware, was also very good on the distance test, but was clearly following in all the other tests. In addition, Solectek had a much higher-priced access point device than the others in this roundup. (Its more reasonably priced version, which shipped after testing, will probably show well the next time we round up wireless LANs.)

AT&T set itself apart in other ways as well. Configuration of the WavePOINT was plug-and-play, except for a few external DIP switches, and the package offered good management. In addition, AT&T offers technical support on a 24-hour, 7-day-a-week basis. This was not only unique in this field; it is rarely seen in the industry.

At review time, AT&T did not offer roaming, but has since released an update with full roaming, making the package even more complete. It's a solid choice in a good field of products.

Our Contributors: PADRAIC BOYLE is a frequent contributor to *PC Magazine*. CHUL SUNG KIM is a technical specialist at ZD Labs. STEVE RIGNEY is a network consultant and a contributing editor to *PC Magazine*. GARY GUNNERSON is the manager of information systems for a Fortune 500 publishing company and a frequent contributor to *PC Magazine*. FRANK J. DERFLER, JR., is senior networking editor of *PC Magazine*. GAIL SHAFFER was the associate editor in charge of this story, and TIM M. CRAWFORD was the technical analyst.

Spread the Signal

By Steve Rigney

A PCMCIA LAN adapter can use one of two spread spectrum techniques: direct-sequence spread spectrum (DSSS) or frequency-hopping spread spectrum (FHSS).

Spread spectrum itself is a method of modulating a data signal so that it occupies more of the radio band than necessary. This "spreading" of the data protects the signal from eavesdropping and interference.

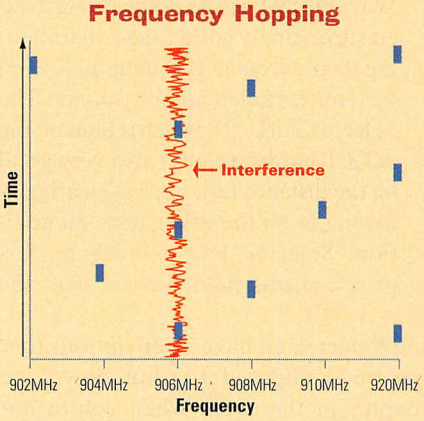
Spread spectrum uses the industrial, scientific, and medical (ISM) bands of the electromagnetic spectrum. The ISM bands include the frequency ranges at 902 MHz to 928 MHz and at 2.4 GHz to 2.484 GHz, which do not require an FCC site license. For these bands to stay license free, the FCC determined that the data signal must use either FHSS or DSSS.

When you are comparing the two, remember that your applications dictate your hardware. If you are concerned with good performance and interference is not a problem, go with a DSSS solution. If you need a small, inexpensive portable wireless adapter for your notebook or PDA, consider an FHSS product.

With FHSS, the radio transmitter jumps, or *hops,* from one frequency to another at a specific rate and in a specific sequence, which appear to be random. For example, an FHSS transmitter may use a hopping pattern that jumps from channel 13 to channel 4 to channel 22. The channel is the frequency width determined by the FCC. FHSS transmitters are limited to 500-KHz–channel bandwidths in the 900-MHz band, and to 1-MHz–channel bandwidths in the 2.4-GHz band. The receiving radio must "know" the transmitter's hopping sequence to safely recover the data.

Because only the intended receiver knows the transmitter's hopping sequence, only that receiver can decode the data. Most vendors develop their own hopping-sequence algorithms, which all but guarantees that two transmitters will not hop to the same frequency at the same time.

But the vendors do not have total freedom. The FCC dictates that the FHSS transmitters must not spend more than 0.4 seconds on any one channel every 20 seconds in the 902-MHz band and every 30 seconds in the 2.4-GHz band. Also, the transmitters must hop through at least 50 channels in the 902-MHz band and 75 channels in the 2.4-GHz band. The IEEE 802.11 committee has drafted a standard that limits FHSS transmitters to the 2.4-GHz band.

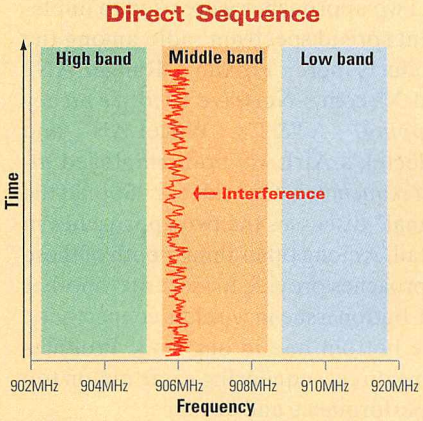


In frequency-hopping spread spectrum (FHSS) radio, the signal spends only a small amount of time on any one frequency in the spectrum. By making the signal hop from one frequency to another, the transmitters increase their immunity to interference in the spectrum.

DSSS radios spread their transmissions by adding redundant data bits called "chips" to them. DSSS adds at least ten chips to each data bit.

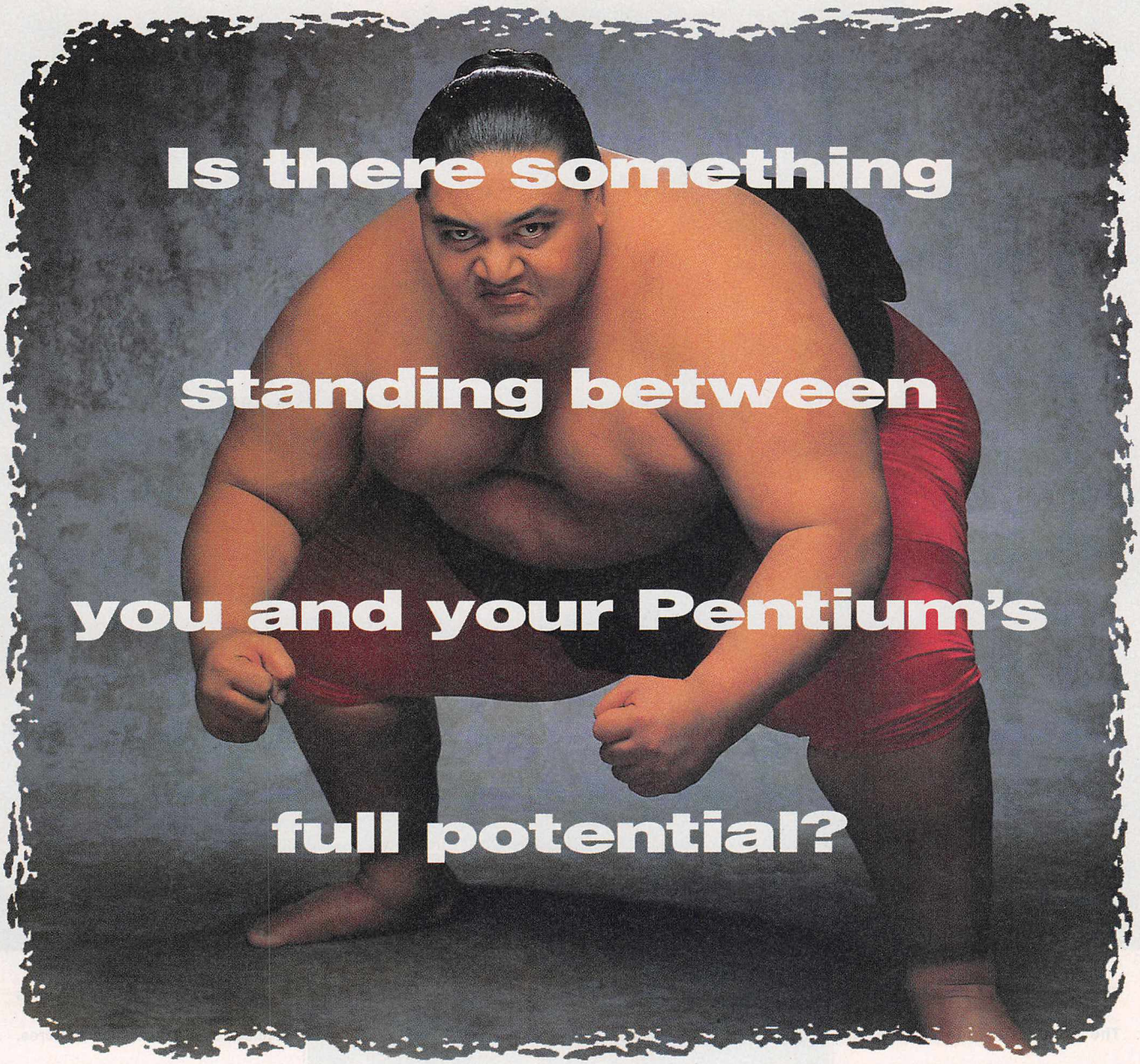
Like an FHSS receiver, a DSSS receiver must know a transmitter's spreading code to decipher data. This spreading code allows multiple DSSS transmitters to operate in the same area without interference. Once the receiver has all of the data signal, it uses a *correlator* to remove the chips and collapse the signal to its original length.

The FCC has also set rules for DSSS transmitters. Each signal must have ten or more chips. This rule limits the practical raw data throughput of DSSS transmitters to 2 Mbps in the 902-MHz band and 8 Mbps in the 2.4-GHz band. Unfortunately, the number of chips is directly related to a signal's immunity to interference. In an area with lots of radio interference, you'll have to give up throughput to combat interference. The IEEE 802.11 committee has drafted a standard of 11 chips for DSSS radios.



Direct-sequence spread spectrum (DSSS) transmitters transmit the signal over a specific band of the frequency spectrum. The signal does not hop around to avoid interference as it does with FHSS. To minimize data loss from interference, the transmitter adds redundant bits, or chips, to the signal, so that it retains enough bits to make it safely to the receiver.

FHSS radios currently use less power than their DSSS counterparts and generally cost less. While DSSS radios have a practical raw data rate of 8 Mbps and FHSS radios have a practical limit of 2 Mbps, FHSS vendors are working on new modulation schemes to improve performance. The IEEE 802.11 draft standard requires a raw data throughput of only 1 Mbps at the low end and a top speed of 2 Mbps. (Stay tuned.) □



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— PC Magazine, 6/28/94 "The Perfect PC"

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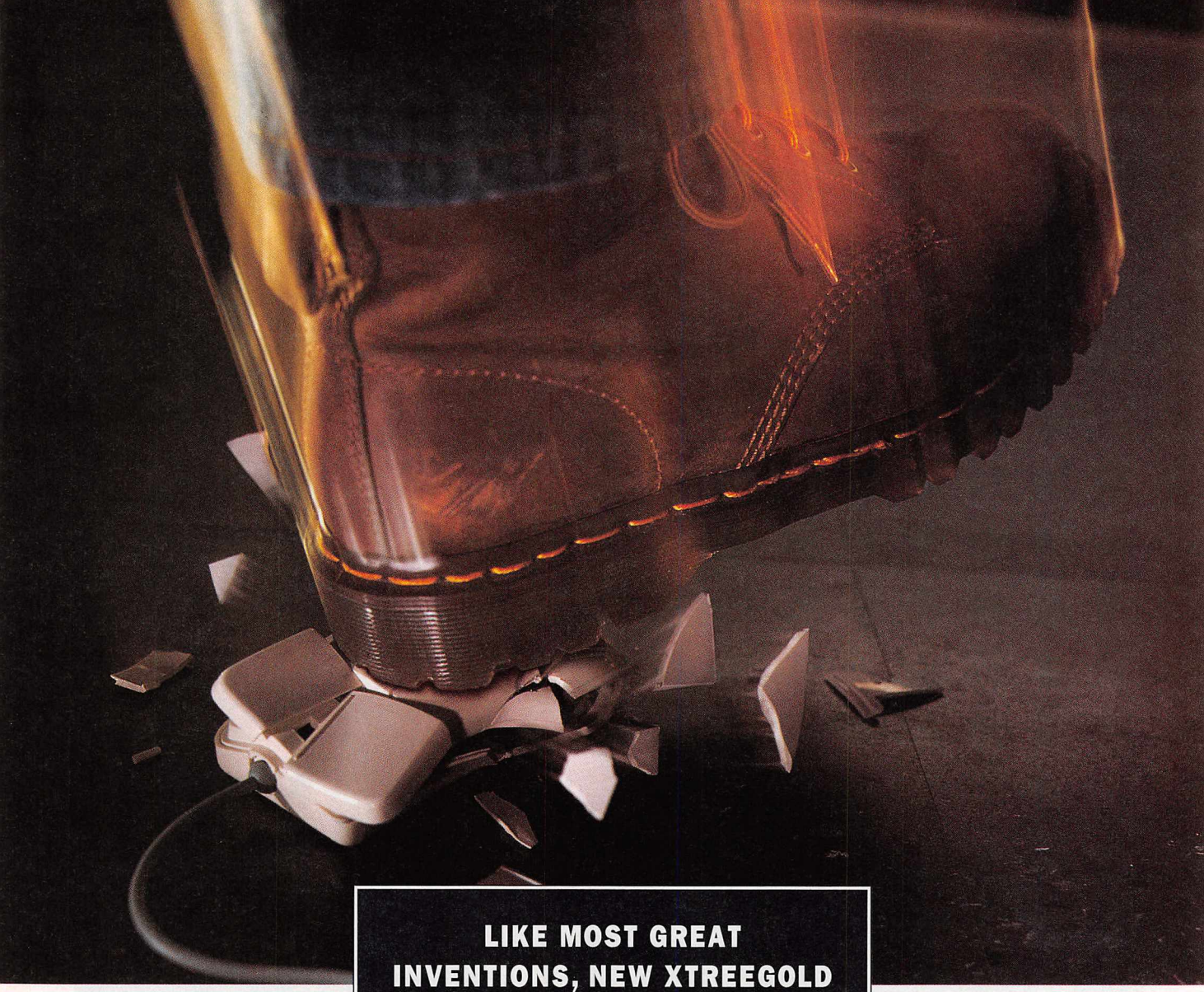
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CIRCLE 117 ON READER SERVICE CARD



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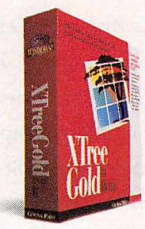
SPEED

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CIRCLE 002 ON READER SERVICE CARD

client PC and an access point. Such types of tools are not only good for placement of your access points or antennas, but they will also assist in diagnosing problem adapters.

Finally, the IEEE (Institute of Electrical and Electronics Engineers) 802.11 committee is currently working on a standard for wireless communications. The standard is not expected to be decided on for at least another year. With any luck, wireless vendors will track the progress of 802.11 and keep their products in the standard's ballpark.

AT&T Corp.

EDITORS' CHOICE

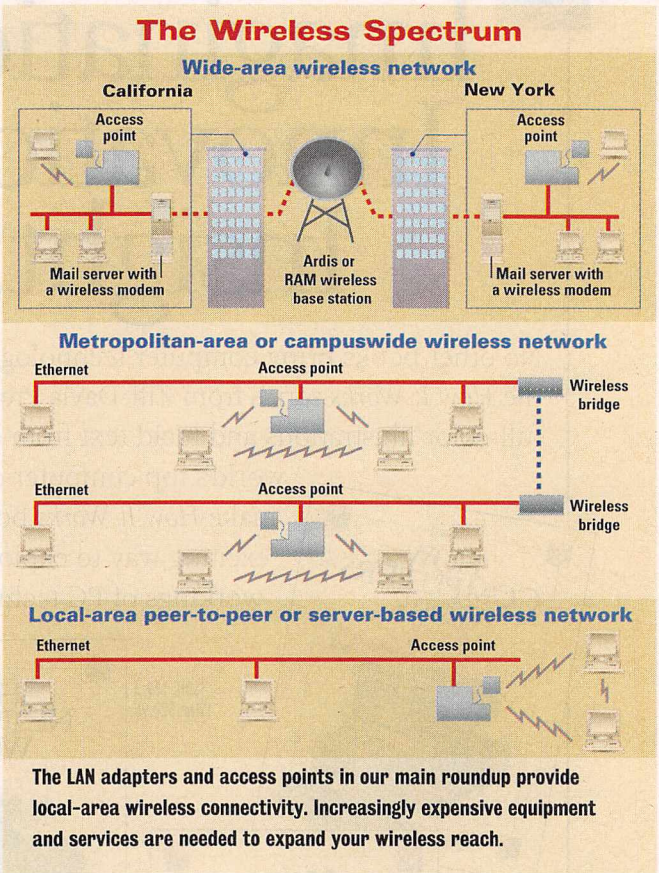
WaveLAN

BY CHUL SUNG KIM

By far the performance champ among the wireless LAN solutions we tested, AT&T's WaveLAN PCMCIA adapter with the WavePOINT bridge are together an excellent choice for wireless LAN connectivity. This solution offers excellent range, good throughput, and strong management features. One of the few things missing is a software installer utility. We had to manually copy and edit files. And switching WaveLAN clients from one access point to another is not easy. Although at review time, WaveLAN did not provide roaming capabilities, AT&T has since released a software update that includes full roaming.

WaveLAN PCMCIA, which uses direct-sequence spread spectrum technology, comes in two pieces: a Type II card, which operates in the 902- to 928-MHz range and slides into your notebook's PCMCIA slot, and a small antenna unit, which attaches to the back of your notebook's display via an adhesive-backed mounting bracket. A flexible 18-inch cable joins the two wireless components. The antenna unit is entirely enclosed and easily removes from its bracket so you can save a few ounces when you travel.

WaveLAN's peer-to-peer performance outpaced the other products in this roundup by a good margin. Switching WaveLAN clients from one access point to another is not a simple task, however. The network ID is written into the adapter's nonvolatile memory rather than read from a configuration file at startup. To change the adapter's ID you need to run a dedicated utility.



The LAN adapters and access points in our main roundup provide local-area wireless connectivity. Increasingly expensive equipment and services are needed to expand your wireless reach.

The leader of the pack in several tests, WaveLAN outdistanced the competition when we used the WavePOINT bridge as an access point to connect stationary wireless WaveLAN clients to a wired LAN. And in bridge-to-client distance tests, WaveLAN turned in a remarkable performance. As long as we maintained a

Suitability to Task: Wireless LANs

The most appealing aspect of wireless networking is the convenience. You aren't tied down to the LAN, and you can move around with relative ease while staying connected. Wireless LAN solutions aren't a straight swap for wired LANs, but they offer a reasonable alternative for users who need the flexibility. We ask if wireless LAN solutions are worth the trouble in the different situations in which you might use them.

In looking at wireless products that use RF technology and support four clients for each LAN access point, we examine three types of wireless connections: peer-to-peer, stationary, and roaming. Performance was an important factor in each category.

SUITABILITY TO TASK	
Peer-to-peer wireless	EXCELLENT
Stationary connection	GOOD
Roaming	FAIR

For **peer-to-peer wireless,** we examine how easy it is to install the adapter and access points and configure the clients. We look at the installer interface to assess ease of use and simplicity. We also consider how much of the configuration is automatic. For example, when you select a network operating system, does the installation utility automatically configure accordingly? We also note the number of network operating systems supported and whether NDIS and ODI drivers are included. Finally, we note Windows support.

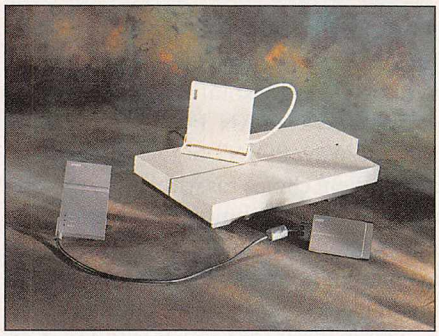
For **stationary connection,** plug-and-play is a big consideration. We look at access-point configuration and whether or not it is automatic. We also assess whether it allows you to use the default configuration or requires you to make modifications to files. We also consider Windows support and look at whether ODI and NDIS drivers are supported.

Under **roaming,** we consider each product's abilities in both full and limited roaming. For full roaming, a client must be capable of moving from one access point to another without losing connection to the server. For limited roaming, the client must be able to log on from various parts of the building and connect to different access points. Limited roaming was not part of our performance tests but may be included in a product's feature set. If a product could do only limited roaming, we give it a rating of *fair.*

clear line of sight, WaveLAN's throughput remained essentially constant from 100 to 1,000 feet. Indoors, under more typical office conditions, the adapter performed more similarly to the other products. We were able to connect through two walls and a glass door with only moderate signal degradation.

Configuration is plug-and-play for WavePOINT bridges connecting stationary clients to a wired LAN, except that you may possibly have to flip a DIP switch or two on the exterior to match your media type. The bridge includes RJ-45, BNC, and AUI connectors.

WaveLAN's management features include wired LAN access control, SNMP MIB II compliance, packet statis-



The AT&T WaveLAN PCMCIA (formerly an NCR product) has an antenna that is both unobtrusive and easy to remove.

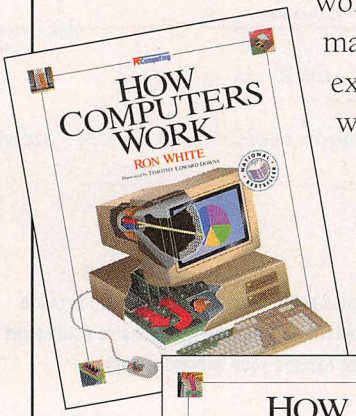
tics, and signal metering. Signal metering uses dynamic bar graphs to show the signal strength and the signal-to-noise ratio. For added network security, an optional DES (Data Encryption Standard) encryption chip is available for $90. WaveLAN also includes power management, which keeps the adapter from consuming more battery life than necessary.

AT&T does not provide a utility to automate installation. We had to copy the driver and other network files from the installer disk manually and also edit the CONFIG.SYS file to load the WaveLAN enabler. For NetWare users, though, installation is straightforward and clearly documented. At testing time, AT&T had not released an NDIS driver for the WaveLAN PCMCIA, which made installation complicated (AT&T has since released an NDIS driver for the WaveLAN PCMCIA).

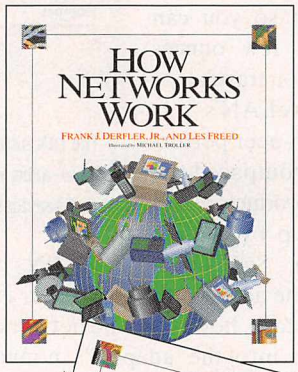
Wireless LAN connectivity may be relatively new, but AT&T's WaveLAN

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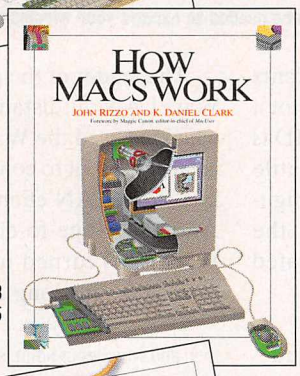
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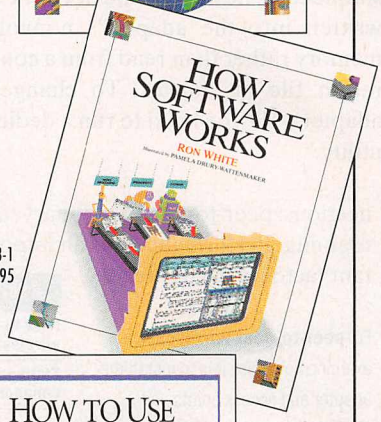
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Price: $22.95



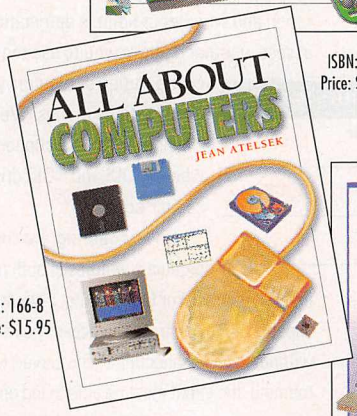
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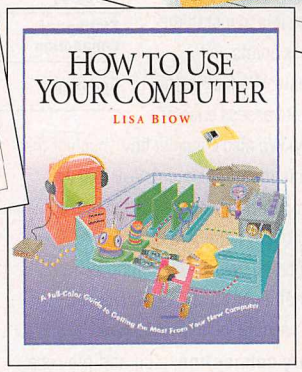
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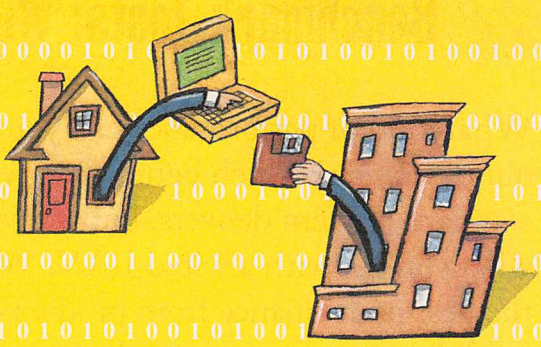
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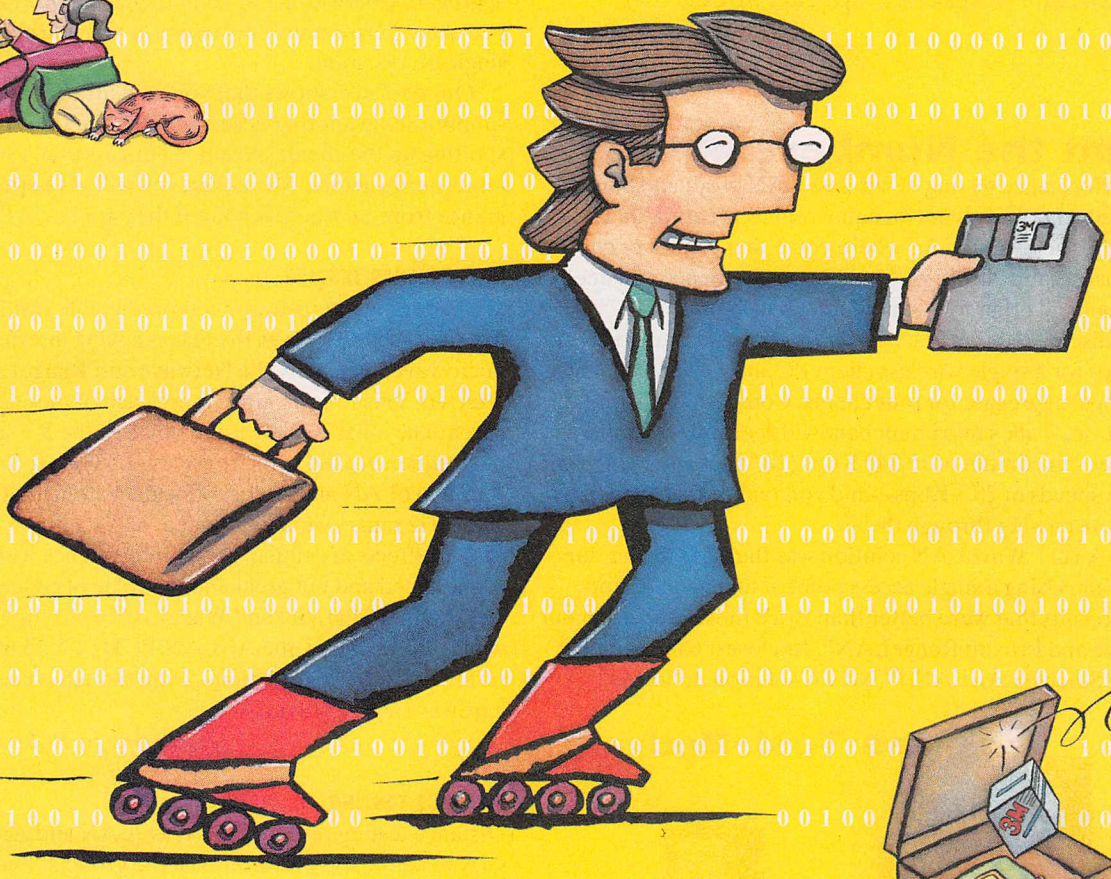
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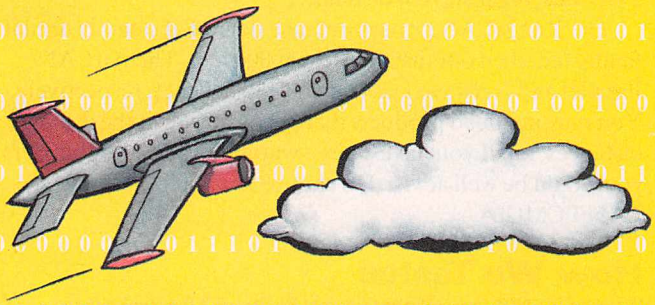
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CIRCLE 910 ON READER SERVICE CARD

Benchmark Tests: Wireless LANs

What kind of performance can you pull out of thin air? Much better than what a standard modem delivers, but worse than what you get with a wired LAN. We saw the best performance from products that used direct-sequence spread spectrum radio.

What the Numbers Mean

Our performance testing of wireless LAN products showed that this technology is not an equal replacement for an Ethernet LAN. But in situations where you either cannot or choose not to use a cable, it will give you the performance you need for e-mail and other low-bandwidth applications.

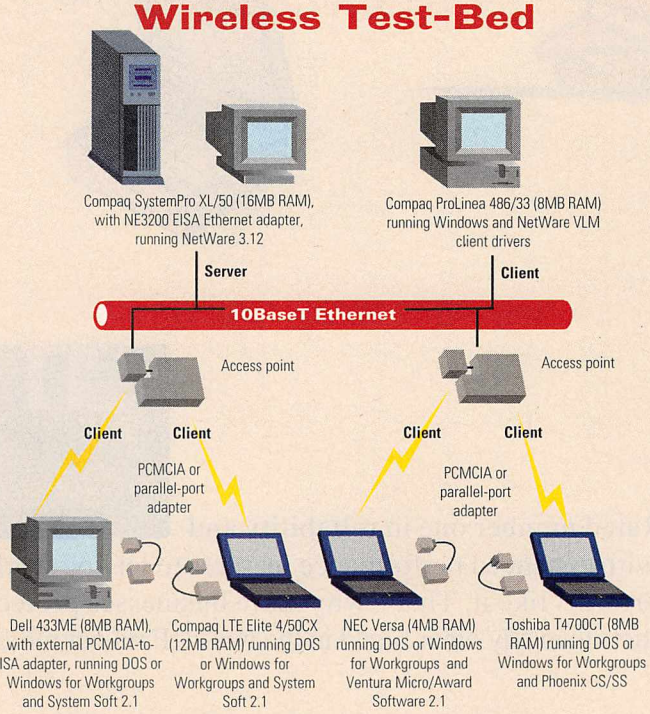
We discovered that you can get throughput of up to about 450 Kbps for a single wireless client PC and up to 1,200 Kbps (1.2 Mbps) aggregate for four clients. Compare this with Apple LocalTalk's maximum bandwidth of 230 Kbps and Ethernet's maximum of 10,240 Kbps (10 Mbps)—or with top modem speeds of 28.8 Kbps—and you realize that there is a lot of data passing through the air.

The AT&T WaveLAN solution was the clear leader during testing. Using a single access point, it managed performance results that were better than twice those of the Xircom Netwave and Proxim RangeLAN2. Its closest competition was the Solectek AirLAN/PCMCIA solution, followed by the Solectek AirLAN/Parallel setup. Solectek Corp. uses AT&T's hardware but provides its own software drivers. Judging from our testing, it seems clear that the SolectekAirLAN drivers are not up to par with the AT&T WaveLAN drivers.

The Netwave and RangeLAN2 did not fare as well. These wireless solutions use only a small slice of radio-frequency (RF) bandwidth, and the size of that slice limits the maximum aggregate bandwidth. For all of the tested products, however, per-client performance decreases as you add clients to a single access point.

Our data also shows that you gain little if anything by simply adding another access point in the same area and splitting up the clients. Again, it appears that a small RF slice limits performance. Moreover, you will get better performance from each access point if they are not in the same area.

Wireless Test-Bed



INTERFERENCE TESTING

We had some interesting albeit predictable results during interference testing. On the test assessing interference from a microwave oven, only the Netwave and RangeLAN2 were affected. This follows, since these each of these products uses a frequency that is in the same range of the RF spectrum as the frequency used in microwaves (2.4 GHz to 2.484 GHz). The WaveLAN and AirLAN products, which operate in the 900-MHz range, were unaffected.

The effects of cellular phone interference were not as pronounced and not great enough to be of concern to users. The AirLAN/Parallel and WaveLAN were slightly affected while, interestingly, the AirLAN/PCMCIA adapter did not suffer the same degradation—even though it used the same hardware as the WaveLAN.

—Analysis by Robert P. Lipschutz

DISTANCE TESTING

Distance testing revealed the WaveLAN and AirLAN/PCMCIA to be the top performers of the group at longer distances. Each product completed our file transfers in about 5 seconds, regardless of distance.

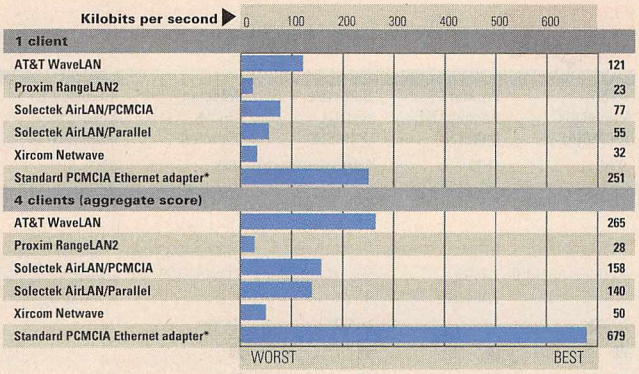
The RangeLAN2's performance degraded steadily until it finally failed on our distance test at 800 feet. The AirLAN/Parallel and Netwave failed at 600 and 500 feet, respectively. You may not need products that perform well at these long distances, but if you have a large warehouse with few barriers, you would be well advised to choose the WaveLAN or AirLAN/PCMCIA.

How We Tested

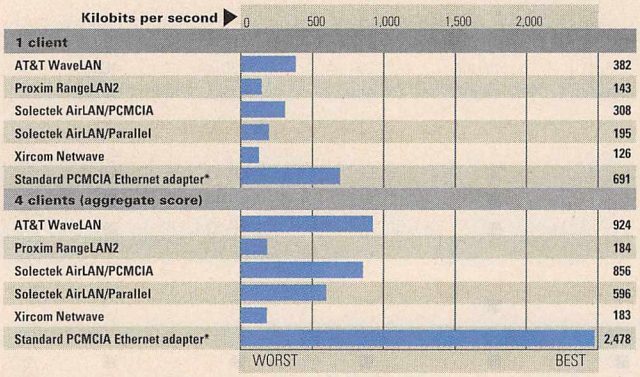
We used the **NIC Throughput** test from NetBench 3.0 to evaluate the amount of data that a wireless adapter can transfer across the network in 1 second. A notebook PC equipped with a wireless adapter issues read requests to a file stored in a server's cache. The test uses 64-, 512-, and 1,024-byte block sizes. We report results in kilobits per second (normally we report results for network performance in megabits per second, but because these results were in a very low range, we thought it more appropriate to report

NIC THROUGHPUT (1 access point)

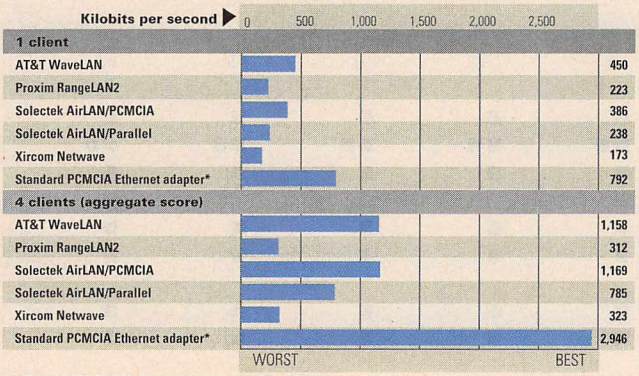
64-byte blocks



512-byte blocks



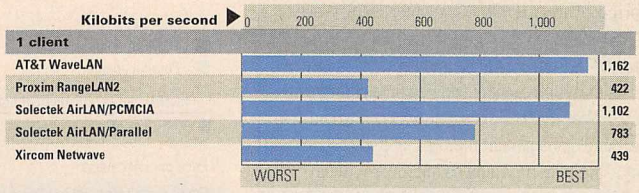
1,024-byte blocks



* 3Com 3C589 PCMCIA Ethernet Adapter, reported for comparison.

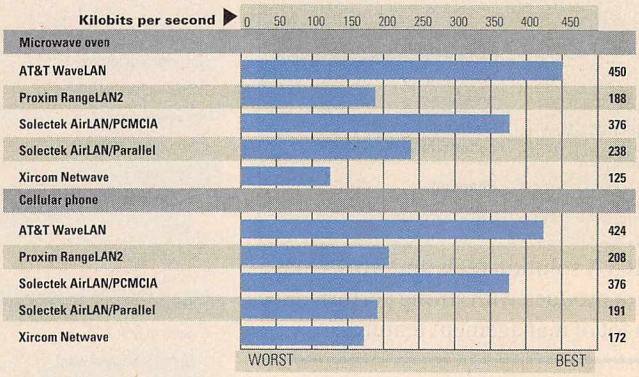
NIC THROUGHPUT (2 access points)

1,024-byte blocks

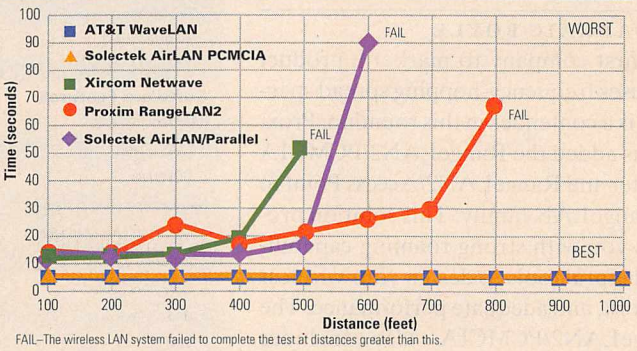


NIC THROUGHPUT (interference)

1,024-byte blocks, 1 client



OUTDOOR DISTANCE (32K file)



FAIL–The wireless LAN system failed to complete the test at distances greater than this.

them using the smaller unit of measure).

We created a network with three notebook PCs, one desktop PC with a PCMCIA-to-ISA adapter, and one server system. Another PC was used as the control station. The clients were configured with NetWare's VLM client drivers and DOS 6.2. If the adapter did not support VLM drivers, we used NETX drivers. The server ran NetWare 3.12. We made no special optimizations on either the clients or the server. We connected the server and the clients to the same Ethernet segment using a 10BaseT wire connected to the access point that was being tested.

We inserted products using a PCMCIA interface into the Type II PCMCIA slot in each of the clients. Card and socket services were used on each of the clients to interface between the OS and the PCMCIA slot. We connected the parallel products to the parallel port on each of the clients.

All of the clients accessed either a single access point or two access points. During testing with two access points, we set up both access points and the four clients on the same domain. If the product was unable to set both access points on the same domain, we evenly distributed the clients across the two access points and connected the two access points to the Ethernet LAN.

For background interference testing, we ran our NIC Throughput test using 1,024-byte blocks with one client and one access point. In one case, we ran a *microwave oven* in close proximity to the client being tested. To test *cellular phone* interference, we made a single continuous phone call on a cellular phone that was within 1 foot of the wireless product's antenna.

For our **Outdoor Distance** test, we transferred a 32K file ten times at distances of 100, 200, 300, 400, 500, 600, 700, 800, 900, and 1,000 feet. We conducted all of the distance testing outdoors and in line of sight.

FACT FILE

WaveLAN

List price: WaveLAN PCMCIA adapter, $695; WavePOINT, $1,995; security chip (optional), $90.

In short: AT&T Corp. offers a mature set of wireless products that is an excellent choice for a solution in this field. WaveLAN offers superior performance and range, good management features, and attractive pricing. This solution would be improved with an automated software install utility. At the time of this review the WaveLAN PCMCIA and WavePOINT bridge provided only limited roaming, but AT&T has since started shipping software with full roaming capabilities.

AT&T Corp., Zadelstede 1-10, 3431JZ Nieuwegein, The Netherlands; 800-334-5454; fax, 719-630-8537.

491 on reader service card

SUITABILITY TO TASK	
Peer-to-peer wireless	GOOD
Stationary connection	EXCELLENT
Roaming	N/A

PCMCIA solution feels and works like a mature product, with strong performance and a lot of management features.

Proxim Inc.

RangeLAN2

BY PADRAIC BOYLE

The first company to market a product that uses frequency-hopping spread spectrum is a contender in this roundup. Proxim has added the RangeLAN2/PCMCIA adapter and RangeLAN2/Access Point to its RangeLAN family. This solution provides you with strong roaming capabilities, helpful tools to design your wireless network, and adequate performance. The RangeLAN2/PCMCIA also includes power-management facilities to help prolong the life of your PC's battery.

The RangeLAN2/PCMCIA is a Type II–compatible PCMCIA Ethernet adapter that operates in the 2.4- to 2.484-GHz frequency range. The RangeLAN2 has an antenna and transmitter that can be conveniently affixed with an adhesive strip to the back of your notebook computer. The antenna is lightweight and easily removable, unlike Solectek's parallel antenna, which is heavy enough to set a notebook PC off balance if it is placed too high.

The RangeLan2/PCMCIA adapter ships with both ODI and NDIS drivers and supports all major network operating systems, including NetWare and LAN Manager, as well as any NDIS-compatible

SUMMARY OF FEATURES

Wireless LANs

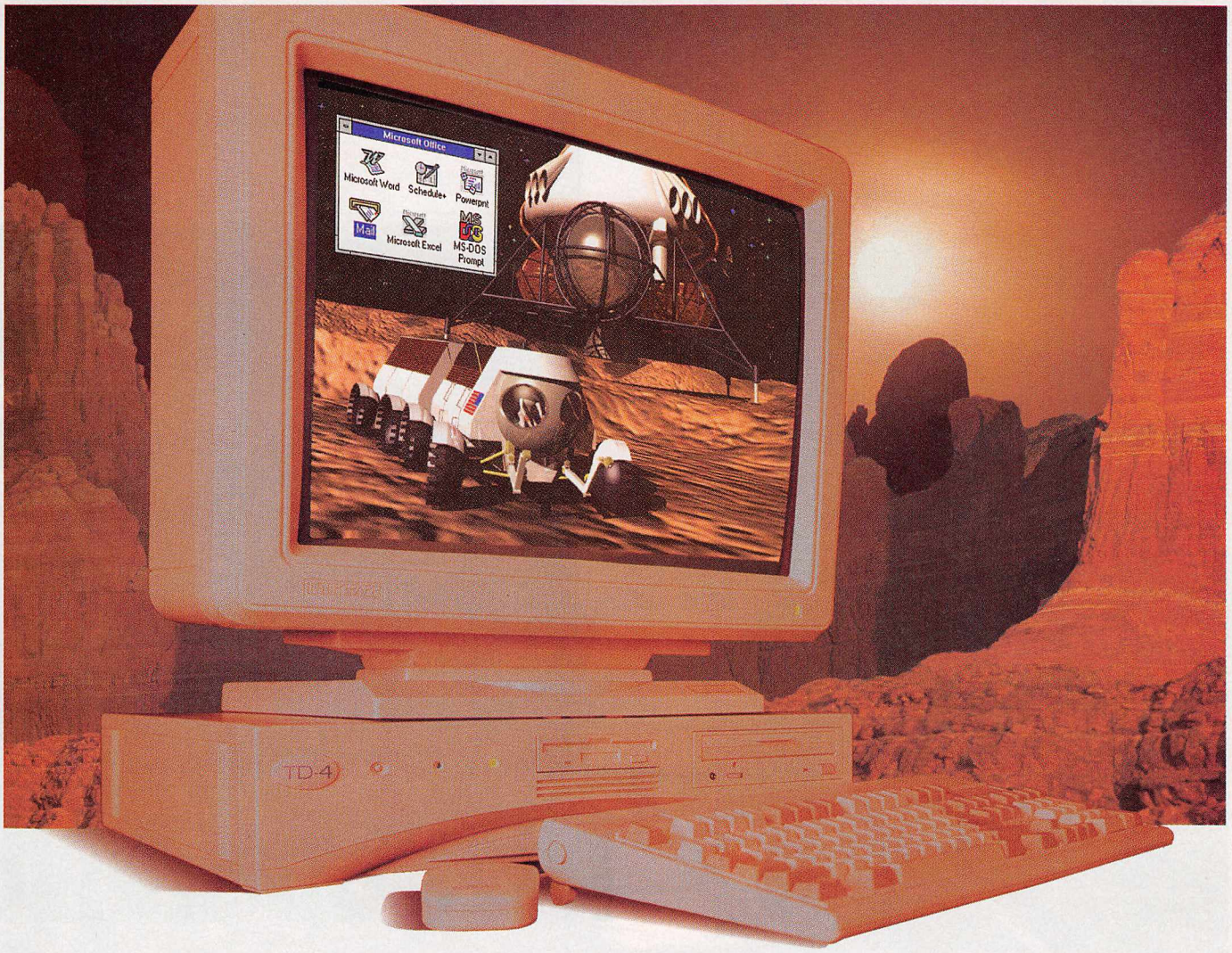
■ = PCMCIA adapter
■ = Parallel adapter

PC MAGAZINE EDITORS' CHOICE

Products listed in alphabetical order ■ = YES □ = NO	AT&T WaveLAN (PCMCIA)	Proxim RangeLAN2 (PCMCIA)	Solectek AirLAN (PCMCIA)	Solectek AirLAN (Parallel)	Xircom Netwave (PCMCIA)
Price per LAN adapter	$695	$695	$699	$699	$599
Price per access point	$1,995	$1,895	$4,799	$4,799	$1,499
Hardware Features					
Modulation technique	Direct sequence	Frequency hopping	Direct sequence	Direct sequence	Frequency hopping
Frequency range used	902 MHz–928 MHz	2.4 GHz–2.484 GHz	902 MHz–928 MHz	902 MHz–928 MHz	2.4 GHz–2..484 GHz
Number of channels used	N/A❶	79	N/A❶	N/A❶	78
Suspend and resume	■	■	■	■	□
Power management	■	■	■	■	□
Hot swapping	□	■	□	N/A❷	■
Power requirements:					
Transmit	600 mA	300 mA	600 mA	600 mA	320 mA
Receive	296 mA	150 mA	296 mA	230 mA	165 mA
Sleep	35 mA	5 mA	35 mA	35 mA	N/A❶
Card and socket services compatibility:					
Phoenix CS/SS	□	■	□	N/A❷	■
System Soft 2.1	□	■	□	N/A❷	■
Ventura Micro/Award Software 2.1	□	■	□	N/A❷	■
Access-Point Features					
Supports roaming	□	■	□	□	□
Cable types:					
10BaseT (UTP)	■	■	■	■	■
10Base2 (coaxial)	■	■	■	■	■
Software Features					
RAM requirements:					
NDIS driver	18K	59.3K	4K	4K	10K
ODI driver	14K	43.6K	12K	12K	10K
Network operating systems:					
Microsoft LAN Manager	■	■	■	■	■
NetWare 3.*x*, 4.*x*	■■	■■	■■	■■	■■
OS/2 LAN Server	■	■	■	■	■
Unix	■	□	□	□	□
VINES	■	■	■	■	■
Windows NT 3.1	■	■	■	■	■
Peer-to-peer software:					
LANtastic	■	■	■	■	■
Windows for Workgroups	■	■	■	■	■
Management Features					
Filtering support:					
Protocols	None	EtherTalk, IP/ARP, IPX, NetBEUI, TCP/IP	None	None	None
MAC address	■	□	■	■	■
Supports SNMP MIB II	■	■	□	□	□
Management software included	■	■	■	■	■
Service and Support					
Warranty	1 year	1 year	1 year	1 year	Lifetime
Technical-support number	800-328-4303	800-229-1630	800-437-1518	800-437-1518	800-874-4428
Hours (eastern time)	24 hours, 7 days	11:00–9:00 M–F	10:00–8:30 M–F	10:00–8:30 M–F	8:00 A.M.–9:00 P.M. M–F
On-line support	Private BBS	Private BBS	Private BBS	Private BBS	CIS, private BBS

N/A❶—Not applicable: The product does not have this feature.

N/A❷—Not applicable: This feature applies only to PCMCIA adapters.



Conceptual design by Robert P. Humeniuk and Jerry D. Flynn of McDonnell Douglas Space Systems

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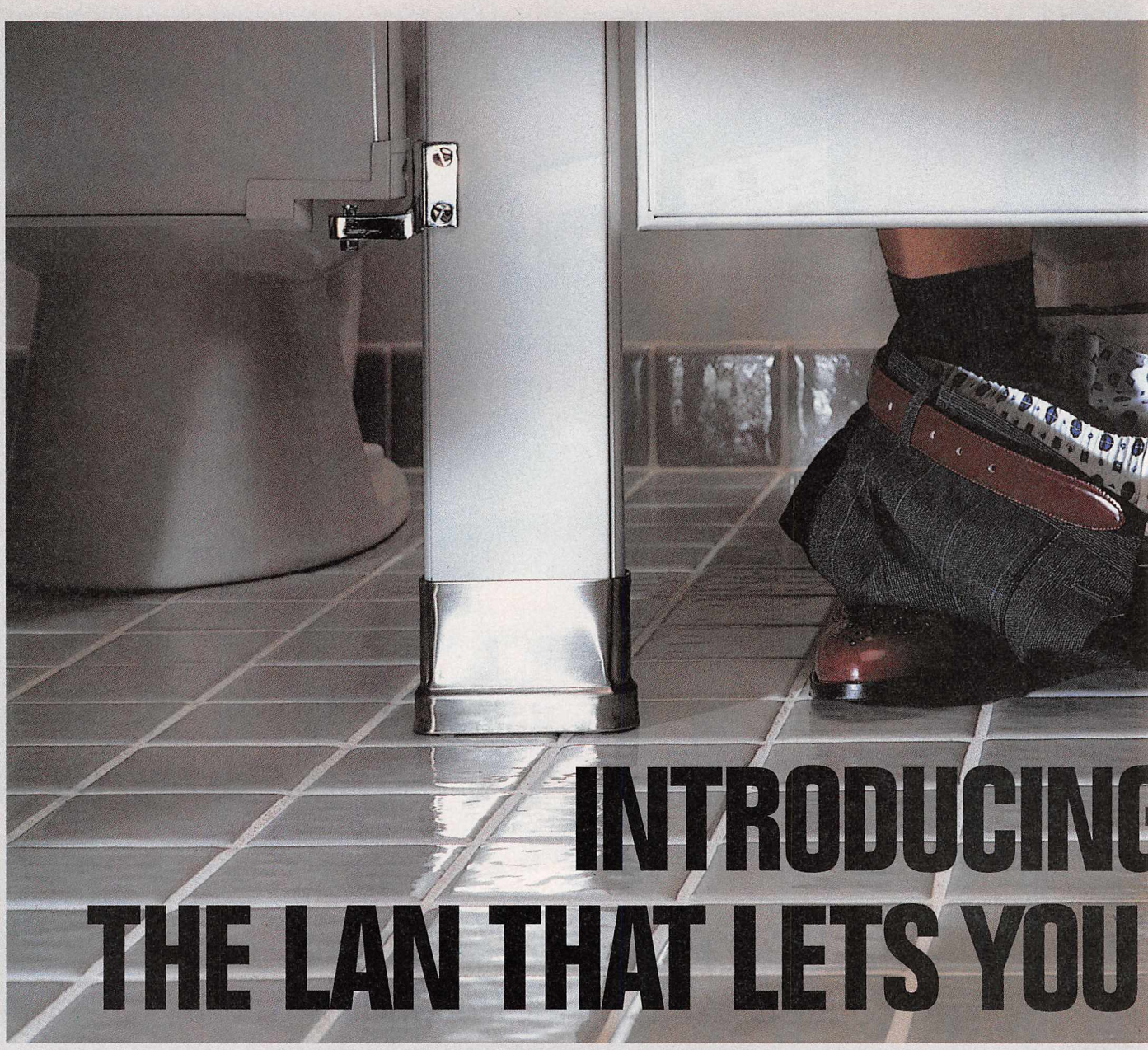
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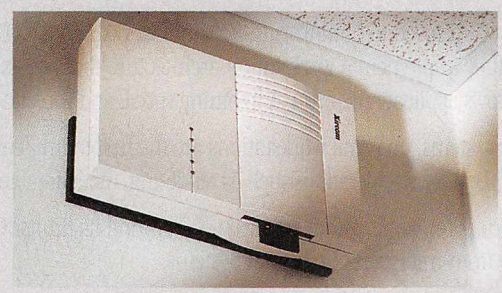
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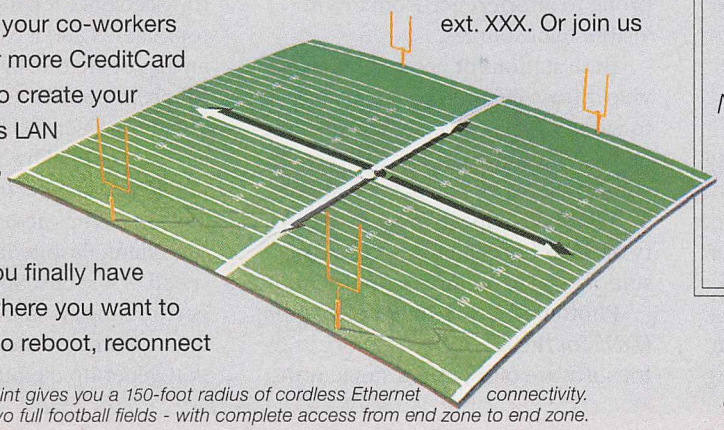
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Light Show

By Chul Sung Kim

As a signaling medium, infrared light has been around for decades. But only recently has this part of the electromagnetic spectrum begun to find acceptance in enterprise networks. We looked briefly at infrared products from four pioneering vendors, Laser Communications (800-527-3740), Photonics (800-628-3033), A.T. Schindler Communications (613-723-1103), and Spectrix Corp.(708-491-4534).

Infrared has some distinct advantages over radio. Although light cannot penetrate walls as radio waves do, this can in fact be a benefit where security is paramount. Infrared transceivers are immune to interference from incidental radio-frequency (RF) sources. Also, infrared transceivers use smaller and fewer parts than RF adapters.

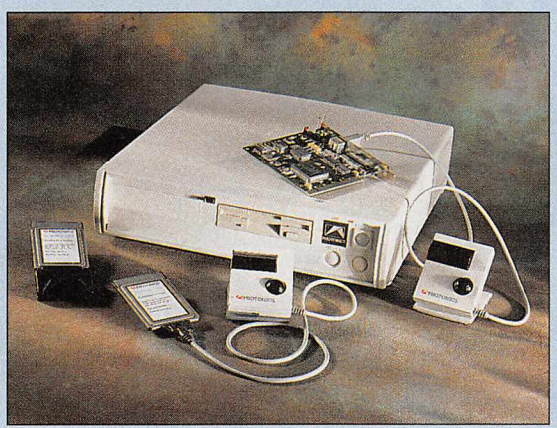
The technology has its drawbacks, too. The nonpenetrating nature of infrared light means that wireless workgroups must generally stay within one room to stay connected. Businesses using infrared hubs to give wireless users access to a wired network will probably have to install more infrared hubs to cover an entire building.

With the exception of infrared lasers, current infrared products generally have a shorter range than their RF counterparts. Some infrared adapters are more sensitive to objects (such as people) passing through the signal path than radio adapters are, while others are susceptible to interference from bright visible-light sources.

Infrared products differ according to the dispersion type of the beam they project: line-of-sight and diffuse. Line-of-sight transceivers, including Laser Communications' $1,025 InfraLAN and Schindler's FiRLAN ($1,595 to $4,995), use lenses to focus the beam tightly along a narrow path. Focusing the beam allows these products to operate over relatively long distances. Maximums range from 110 to 1,250 feet for the FiRLAN family and to 80 feet for InfraLAN.

Line-of-sight pairs must be in near-perfect alignment to maintain a link. Their high throughput and unit cost makes line-of-sight transceivers best suited for use as wireless repeaters between wired LANs, where the investment can be leveraged to support many users.

Diffuse infrared products transmit light evenly in a wide semispherical pattern. Their receivers have fields of vision to match, so users equipped with these adapters can wander around a room while maintaining their network connections. We looked at Photonics' Collaborative PC ($495) and PCMCIA ($595) and the Spectrix $495 SpectrixLite.



Photonics' Collaborative wireless products, which include the PC and PCMCIA adapters, use flexible diffuse infrared technology to make a wireless connection.

Diffuse infrared is forgiving about transceiver orientation, but not to the degree that radio is. The Collaborative PC and PCMCIA adapters maxed out at about 30 feet in testing; the SpectrixLite, with its serial interface, had a 50-foot range. Ranges shorten considerably if only reflected room light is available. Diffuse adapters are also prone to interference from bright visible-light sources.

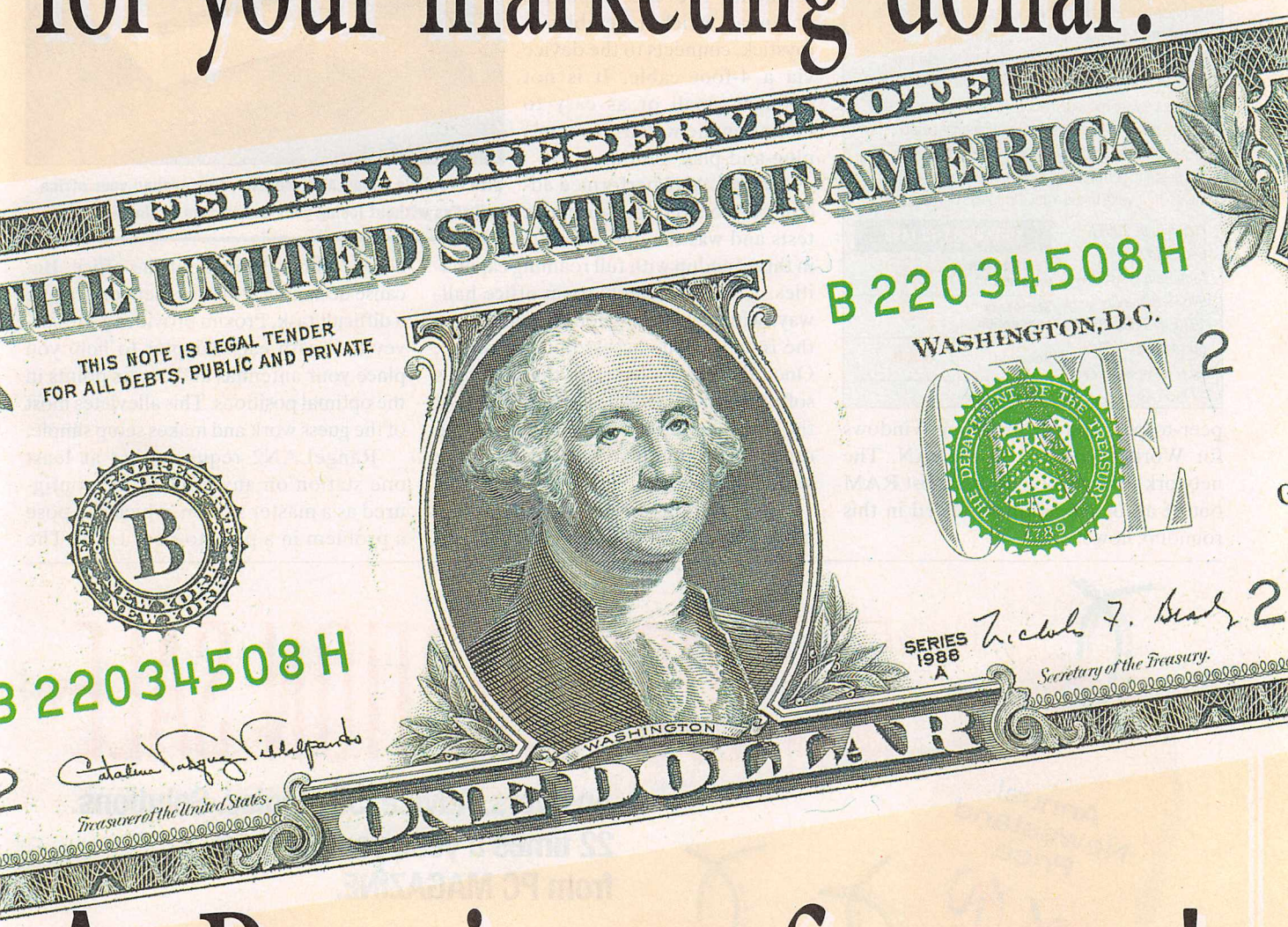
Base stations or access points provide diffuse infrared clients with access to wired LANs. Spectrix's $2,698-and-up base station mediates between the wireless network and a NetWare or TCP/IP LAN. Spectrix claims a capacity of up to 1,000 clients for the base station, which requires a dedicated PC.

Photonics' EtherPoint access point ($895 for the hardware version, $129 for software only) uses a single transceiver identical to the one used by the client adapters. But several access points may be attached to the same wired LAN to provide roaming capabilities similar to those of the Spectrix product.

Equipping your NetWare or NDIS-compliant server with a Photonics PC adapter is another way to bridge wired and wireless. It costs less than a separate EtherPoint but isn't as scalable. You can also use Photonics' adapters in peer-to-peer networks without an access point; you can't do this with Spectrix.

In limited NetBench 3.0 testing, infrared performance ran the gamut from pokey to blazing fast. The A.T. Schindler and Laser Communications transceivers each moved data between four clients and a NetWare server with an aggregate throughput close to 3 Mbps. Photonics' Collaborative provided just over 200 Kbps with one client. Hobbled by its 38.4-Kbps serial interface, the SpectrixLite managed only 15.5 Kbps actual throughput with one client, despite its rated signaling speed of 4 Mbps. Spectrix says the performance is sufficient for the low-data-volume transactional applications that generate the bulk of its sales. □

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FACT FILE

RangeLAN2

List price: RangeLAN2/PCMCIA, $695; RangeLAN2/Access Point, $1,895.

In short: Top-notch roaming capabilities, adequate performance, and helpful tools for designing your wireless network all combine to recommend Proxim's RangeLAN2/PCMCIA and Access Point. The solution comes equipped with a site-survey tool to help you position antennas and access points. RangeLAN/2 also includes power management to help prolong the life of your battery. One drawback is a requirement that one or more client PCs be designated as master stations—this can degrade performance in a peer-to-peer arrangement. Otherwise this is a good wireless LAN solution.

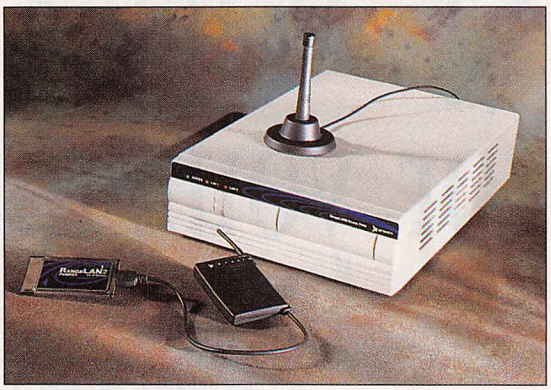
Proxim Inc., 295 N. Bernardo Ave., Mountain View, CA 94043; 800-229-1630, 415-960-1630; fax, 415-960-1984.

492 on reader service card

SUITABILITY TO TASK	
Peer-to-peer wireless	GOOD
Stationary connection	FAIR
Roaming	GOOD

peer-to-peer system, including Windows for Workgroups and PowerLAN. The network drivers took up the most RAM out of all of the adapters tested in this roundup, however.

About half the size of a small desktop computer, the RangeLAN2/Access Point bridges the gap between stationary and roaming wireless client PCs and a wired LAN segment. The access point's antenna, which resembles a joystick, connects to the device via a 4-foot cable. It is not quite as small or as easy to mount on the wall as Xircom's plug-and-play solution.



With Proxim's RangeLAN2 you can roam around your office hallways without losing your connection to the LAN.

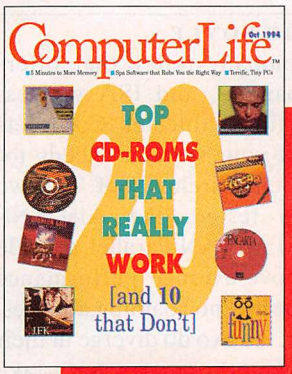
RangeLAN2 performed adequately on our performance tests and was the only product in this roundup with full roaming capabilities. Users can freely roam office hallways with no transmission gaps so long as the ranges of the access points overlap. Once the ranges overlap, the adapter's software detects itself leaving the range of the attached access point and polls the other access points to see which has the strongest signal.

How well this works depends principally on how you position antennas and access points throughout the office. Because designing a wireless network can be a difficult task, Proxim provides a site survey tool with each adapter to help you place your antennas and access points in the optimal positions. This alleviates most of the guess work and makes setup simple.

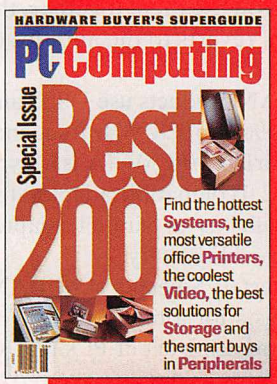
RangeLAN2 requires that at least one station on any network be configured as a master station, which can pose a problem in a peer-to-peer LAN. The



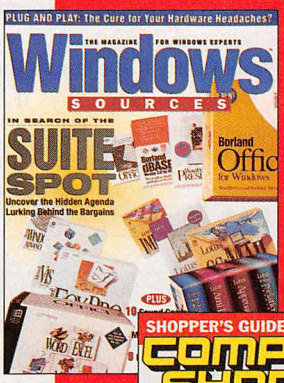
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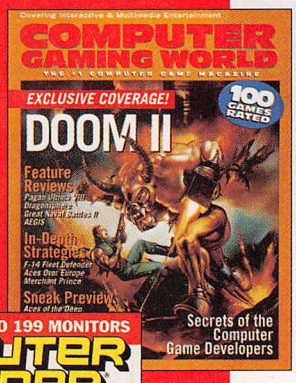


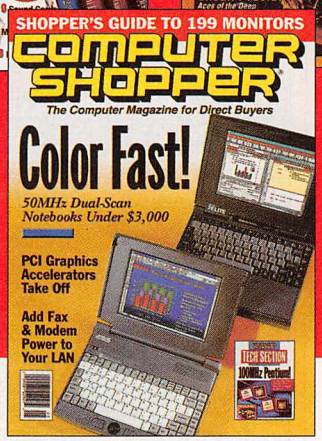












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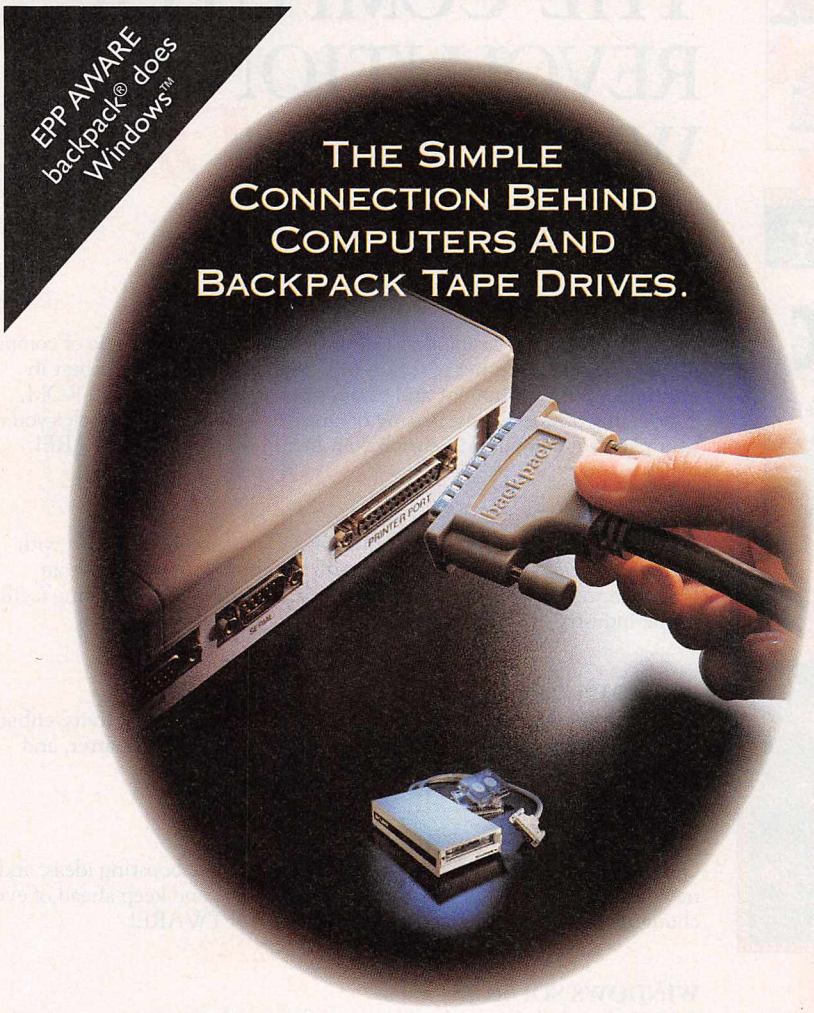
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master station acts as a synchronization clocking mechanism for each client PC's hopping frequency. If the master station is down, then an alternative master station needs to be available to take over.

This does not pose much of a problem when a server is configured as the master, but in a peer-to-peer environment with mobile users, you must designate all of the client PCs as alternate masters. And, unfortunately, performance can suffer if you appoint too many alternate masters.

Overall, RangeLAN2's excellent roaming capabilities, design tools, and adequate showing in our performance tests make it one of the better wireless networking solutions on the market today.



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Solectek Corp.

AirLAN

BY PADRAIC BOYLE

The only company today that offers PCMCIA, parallel, and ISA wireless adapter solutions, Solectek Corp. lets you bring all your systems' needs together under one wireless roof. The two adapters we tested, the AirLAN/PCMCIA and AirLAN/Parallel, provide generally above-average performance and range but had no roaming abilities. Furthermore, the two do diverge in their performance and range, but—take note—when you use them together, the wireless LAN reverts to the abilities of the lesser.

The AirLAN products use DSSS and operate in the 902- to 928-MHz frequency range. The AirLAN/PCMCIA is a Type II, PCMCIA 2.0 compatible adapter; the AirLAN/Parallel is a parallel adapter with a rechargeable battery.

We also tested Solectek's AirLAN/Hub, which lists for a high $4,799. The hub is for connecting client PCs that sit beyond the maximum distance allowed by a wireless server. (After testing was complete, Solectek released the AirLAN/Access for $2,499. This is an update to the AirLAN/Hub, which Solectek says it is phasing out of production.)

The AirLAN/PCMCIA adapter's an-

FACT FILE

AirLAN

List price: AirLAN/PCMCIA, $699; AirLAN/Parallel, $699; AirLAN/Hub, $4,799.

In short: Solectek stands apart from other wireless vendors by offering PCMCIA, parallel, and ISA wireless solutions. The PCMCIA adapter performed better than average, but the parallel-port adapter was less capable. These products provide no roaming capabilities. When you use both on the same wireless network, the system will revert to the capabilities of the AirLAN/Parallel. Solectek has a new version of the AirLAN/Hub that was not released in time for testing. It is much better priced than the model we tested.

Solectek Corp., 6370 Nancy Ridge Dr., #109, San Diego, CA 92121-3212; 800-437-1518, 619-450-1220; fax, 619-457-2681.

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SUITABILITY TO TASK	
Peer-to-peer wireless	FAIR
Stationary connection	GOOD
Roaming	N/A

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Solectek offers a variety of adapters—PCMCIA, parallel, and ISA—for just about any type of network environment.

tenna, which is lightweight and easy to remove, mounts into a plastic bracket on the back of the PC. The AirLAN/Parallel adapter also mounts on the shell, but its bulk can throw a notebook PC off balance if it is mounted too high. This is due mainly to its rechargeable nickel cadmium battery (with a life of 10 hours). The AirLAN adapters come with power-management software that helps conserve battery life.

Both of the AirLAN adapters performed admirably in our tests, but the AirLAN/ Parallel was slower than the AirLAN/ PCMCIA. We saw the biggest difference in the range test. While the AirLAN/PCMCIA maintained performance to more than 1,000 feet, the AirLAN/Parallel could not reach 700 feet.

We tested both adapters with the Solectek AirLAN/ Hub, which is a small footprint CPU with software included. To install the software, we had to alter some files manually to operate with different NOSs. Both AirLAN series adapters support the major NOSs, including NetWare 3.*x*, NetWare 4.*x*, NetWare Lite, and Microsoft LAN Manager, and peer-to-peer packages, such as Windows for Workgroups and Artisoft LANtastic. Solectek's products support ODI and NDIS.

Both AirLAN adapter products come with a point-to-point diagnostic tool that helps you evaluate the quality of the adapter's radio-frequency link. The diagnostic software can also help you design your network by assessing the signal-to-noise ratio, signal quality, and the signal's level. You can use this information to position AirLAN/Hubs where they are most effective. We could not, however, run the point-to-point test between the two adapters. (Solectek is working on a solution.)

Solectek's AirLAN wireless series offers a solution for nearly any kind of system: a desktop PC with a parallel port, a notebook PC with a PCMCIA slot, or even a pen-based system with a parallel port or PCMCIA slot. Remember that in a mixed PCMCIA-and-parallel environment, though, you'll have to design the network to compensate for the AirLAN/Parallel adapter's limitations.

Xircom Inc.

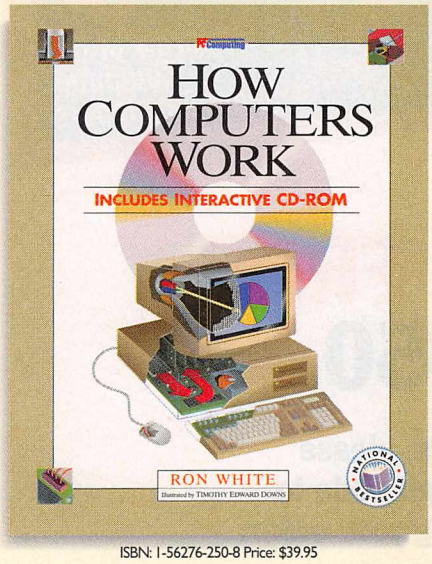
• Netwave

BY PADRAIC BOYLE

Xircom not only gets rid of the wire in this wireless LAN solution; the CreditCard adapter also does away with the antenna by incorporating it into the PCM-

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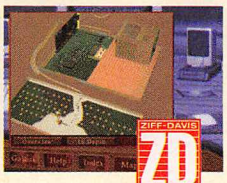
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CIA card itself, leaving only a small stub protruding. This unique design has its pros and cons.

It makes this adapter even more portable and flexible than the other solutions in this roundup. Not having an antenna hanging off of your notebook PC makes moving around that much simpler, especially if you are a pen-based user.

For some, it may make up for the difference in performance we saw between this adapter and the others. The antenna's small size and the adapter's relatively low transmit power do limit transmission capabilities and reach. You may need to purchase multiple access points to properly connect your entire office. In addition, at the time of our review, Netwave did not include roaming; Xircom plans to have a software upgrade with full roaming support out by the time you read this.

Like Proxim's RangeLAN2, Netwave uses a frequency-hopping spread spectrum radio that operates in the 2.4- to 2.484-GHz frequency range to transmit and receive data. The adapter works with the Netwave Access Point to connect a mobile or stationary client to a wired LAN, or directly with other Netwave adapters on client PCs in a peer-to-peer LAN. Netwave supports multiple network operating systems, including NetWare and Microsoft LAN Manager, as well as peer-to-peer packages such as Microsoft Windows for Workgroups. It supports both ODI and NDIS.

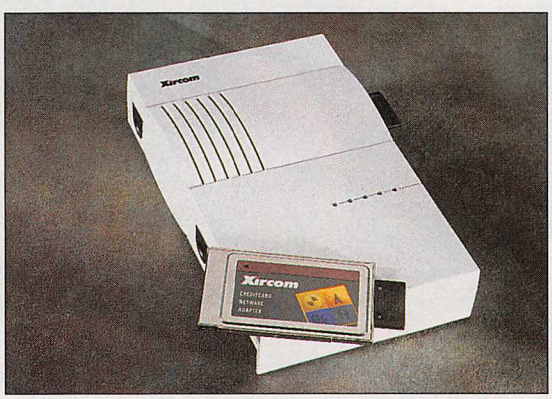
The Access Point creates a "service area" around itself to provide wireless communications within a 164-foot radius. However, if your network exceeds the range of the adapter, you need to purchase at least two access points and wire them together for additional coverage.

To let users move around, you place multiple access points strategically to make up a series of service areas that slightly overlap each other, creating one large service area. The Access Point is a compact, lightweight device that you can place on a shelf or mount on a wall, depending on your office space.

Netwave allows you to set up security in several ways. You can segment your network into domains that include different address numbers, so that only client PCs in that domain can gain entry into that access point or peer-to-peer network. You can also manually authorize card addresses and add a scrambling key to ward off intruders.

Management of the access point is limited; the software can run only on a system running IPX on a wired segment of the network. The management software, AP-Manager, lets you set a password, change domain numbers, add user addresses, upgrade software, enable the scrambling key feature, and name the unit.

Netwave offers flexibility, usability, and good security features. It could use better performance and distance capabilities. Still, it's a very portable, very appealing solution. □



Xircom pushes the compactness envelope by building the antenna into the card, but it was slower than the rest.

FACT FILE

Netwave

List price: CreditCard Netwave Adapter, $599; Netwave Access Point, $1,499

In short: Xircom's Netwave wireless solution comes with a few trade-offs. The CreditCard Netwave Adapter is compact and very easy to use—the antenna is actually inside the adapter, with only a small stub protruding. Its security features are also impressive. However, the Netwave's performance was not as strong as others here, although its list pricing is a bit lower. At review time Netwave did not include roaming, but Xircom plans to upgrade hardware and software to include full roaming.

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494 on reader service card

SUITABILITY TO TASK	
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Stationary connection	FAIR
Roaming	N/A

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PC Tech

He's back. After a hiatus of more than a year, Power Programmer Ray Duncan rejoins PC Tech with the first of several articles on electronic publishing using the Windows help system.

User-to-User

BY NEIL J. RUBENKING

A Simpler Way to Change Drive and Directory

I was intrigued by the complex batch file CDD.BAT in the January 11, 1994, User-to-User column. Some time ago, I discovered that entering a command like D:\TEMP\ at the DOS prompt switches you to drive D: (the current directory, not \TEMP) just as if you had entered D: only. You get no error message, though DOS replies with the usual "Bad command or file name" if you omit the drive letter and colon. This led me to a much simpler solution to changing the drive and directory using a batch file that accepts a single parameter (although the solution has a minor quirk):

```
@ECHO OFF
%1\
CD %1
```

You use the same syntax as with the earlier version, `CDD drive:path`. If you plan to distribute the batch file, you might want to add a section describing CDD's usage when no parameter is entered.

In this version of CDD.BAT, entering CDD D:\TEMP or CDD D:\ works as expected. CDD \TEMP or CDD \ will also work, but with a misleading "Bad command or file name" message. Do you know a simple way to remove this glitch?

Sean O'Neill
London, England

▶**PC MAGAZINE:** Besides performing the task of changing to a new drive and directory with a single command, the original CDD.BAT illustrated a technique for processing strings in batch files. Indeed, it was a complicated thing compared with this new version. Figure 1 shows a new CDD.BAT, modified to avoid both the glitch mentioned above and another minor problem.

When you omit the drive letter and colon from its parameter, CDD.BAT still functions correctly: It switches to the selected directory on the current drive. The "Bad command or file name" message is useless, so CDD.BAT suppresses it (and all other input and output) by means of the CTTY NUL command before the offending line. CTTY CON restores normal input and output afterward. Be very careful when using the CTTY command. If a batch file fails to restore normal input and output with CTTY CON, you'll have to reach for the reset switch!

The other minor glitch with the new CDD.BAT was that if you specified a nonexistent directory, the batch file would still switch to the specified drive. Therefore the version in Figure 1 switches drives only if the directory exists. In DOS, the IF EXIST test always returns true for a DOS device such as NUL, unless the DOS device is prefixed by a nonexistent directory. In that case, the batch file does not switch to the new drive.

Mr. O'Neill suggests that a version of CDD.BAT for distribution might require a message explaining its syntax. I find, though, that the DOS commands within the batch file provide all the messages required. CDD with no parameters displays the current directory, just like the CD command. CDD with a nonexistent directory returns "Invalid directory." And CDD followed by a nonexistent drive letter gets "Invalid drive specification."

```
@ECHO OFF
CTTY NUL
IF EXIST %1\NUL %1\
CTTY CON
CD %1
```

PC MAGNET

***Figure 1:* CDD.BAT changes drive and directory with a single command.**

Running Just One Program Under Windows

Your issue of August 1994 presented a solution for running just one program under Windows. The method consisted of using either INI.EXE to modify the SYSTEM.INI file or the Borland Pascal

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```
@echo off
c:
cd \windows
type system.ini ¦ find "[boot]" /i /v ¦ find "shell=" /i /v > sysini.$$$
del ~system.ini
ren system.ini ~system.ini
echo [boot] > system.ini
echo shell=%1.exe >> system.ini
type sysini.$$$ >> system.ini
del sysini.$$$
win
del system.ini
ren ~system.ini system.ini
```

Figure 2: **To run just one program under Windows, pass the program name (minus the .EXE extension) to ONEPROG.BAT.**

program SHELLR.EXE to run the Windows program listed under the SHELL DOS environment variable. As indicated, SHELLR had the following drawbacks:

- Program Manager's start-up actions are disabled—that is, programs in the StartUp group or on the Load= line in WIN.INI are ignored;
- a program specified after WIN.COM on the DOS command line won't be loaded; and
- the Windows Start and Exit sound events are disabled.

I found the following factors somewhat limiting as well:

- Readers may not have access to Borland Pascal to compile the SHELLR.EXE program;
- readers may not have access to ZiffNet to download SHELLR.EXE or INI.EXE; and
- SHELLR.EXE consumes space in the DOS environment by requiring the SHELL variable.

As a result, I decided to create a DOS batch file to do the job. My solution (Figure 2) provides the same functionality and imposes practically no limitations.

ONEPROG.BAT first removes the `[boot]` section marker and the line reading `shell=` from the SYSTEM.INI file. This is done by twice piping through FIND with the /v switch, which displays all but the matching lines. (The /i switch is simply to make the search case-insensitive.) The resulting output is redirected into a temporary file called SYSINI.$$$. ONEPROG then backs up SYSTEM.INI by renaming the file to ~SYSTEM.INI.

After this, a new SYSTEM.INI is created by echoing `[boot]` and `shell=%1.exe` into it; the `%1` is of course replaced by the single program that is to be run under Windows. Then the temporary SYSINI.$$$ file is appended to the new SYSTEM.INI, the temporary file is deleted, and Windows is finally started. Upon return, the batch file does some cleaning up and restores the original SYSTEM.INI file.

ONEPROG.BAT accepts one argument—the program to run as the shell under Windows. Because the original SYSTEM.INI file is restored upon return, the next time you type WIN on the command line, Windows starts with Program Manager and everything functions normally. The advantage of this is that there are no penalties. Even the Windows Start and Exit sounds work, and no permanent change is made to the `shell=` setting.

I said that this solution has "practically no limitations." Well, there is one: `[boot]` must be the first section in SYSTEM.INI or the batch file fails to achieve its goal. Since this is the case in most Windows and Windows for Workgroups installations (unless someone has intentionally reordered the sections in SYSTEM.INI), the limitation is probably negligible.

Atif Aziz
Geneva, Switzerland

▶PC MAGAZINE: Apparently there's quite a bit of interest in this topic; another reader recently supplied a solution using the *PC Magazine* utility WINCMD (for that solution, see the User-to-User column "Restricting Windows Usage to a Single App," which appeared in our December 20, 1994, issue). The current batch file solution has the virtue of using nothing but built-in DOS commands. If you use Windows for the sole purpose of running, say, a specialized graphic design program, one of these solutions may streamline your work.

Note that when you run *any* program other than PROGMAN.EXE (or a true substitute like The Norton Desktop) as your shell, programs listed in the StartUp group or the `LOAD=` and `RUN=` lines of WIN.INI will not be executed, nor will a program specified on the WIN.COM command line. This limitation is by no means specific to the SHELLR.EXE program mentioned above. But since the point of ONEPROG.BAT is to run one program only, this should not be a problem.

There is one very slight risk in using ONEPROG.BAT. If it processes a SYSTEM.INI file in which the `[boot]` section does not come first, Windows may not run at all. At my request, Mr. Aziz devised a safety net, which is shown in Figure 2. ONEPROG2.BAT checks to make sure that the very first line of WIN.INI is `[boot]`. If so, ONEPROG2.BAT runs ONEPROG.BAT; if not, it exits with a warning.

You can download both batch files from PC MagNet's Utilities/Tips Forum, archived as 1PROG.ZIP. □

```
@echo off
if '%1'=='' GOTO NoParam
type c:\windows\system.ini ¦ find /n /i "[boot]" ¦ find /i "[1][boot]" > NUL
if errorlevel 1 goto notfirst
oneprog %1
goto exit

:notfirst
echo Boot is NOT the first section in SYSTEM.INI
echo Please make sure that it is the file line in your SYSTEM.INI.
goto exit

:NoParam
echo One command line parameter is required - the name of the
echo program you want to run, without its .EXE extension

:exit
```

Figure 3: **ONEPROG.BAT assumes that the [boot] section of SYSTEM.INI is the first section; ONEPROG2.BAT makes sure this is true.**

Tutor

BY JEFF PROSISE

Memory: A PC's Most Precious Resource

RAM (random access memory) is an issue that every PC user grapples with at one time or another, for the simple reason that there never seems to be enough of it. My first personal computer had 64K of RAM. That seemed like a lot at the time, because other computers came with only 16K. RAM has always been a problem with DOS, because no matter how many megabytes of RAM a PC was blessed with, DOS was still limited to essentially 640K of useable RAM. In recent years, Windows has done much to ease the RAM crunch. But in today's very sophisticated computing environments, you need lots of RAM to run the most rudimentary of programs. It seems that the amount of RAM you need will always be about twice what you have right now.

Have you ever wondered how a computer stores data in RAM? Finding a readable (and accurate) explanation—one that doesn't presume you have an electrical engineering degree—of how computer memory works is extremely difficult. This issue's Tutor column will attempt to remedy that. Let's take the lid off the box for a look inside and see what makes a RAM chip work. In the process, you'll gain a deeper understanding of how your PC works and pick up a few practical insights, too.

A SIMPLE ONE-CELL DRAM There are several different types of RAM. The most common is dynamic RAM, better know as DRAM. Another is static RAM, or SRAM. DRAM is the type most often used for memory storage in PCs. Because of its simple design, DRAM is easy to manufacture—and therefore inexpensive.

Computers deal exclusively in binary (or base 2) numbers composed of 0s and 1s. Internally, a decimal number such as 13 is stored as a sequence of binary digits (1101). Each digit requires 1 bit of storage space. A typical DRAM chip stores each bit's value in a memory cell consisting of two elements: a capacitor and a transistor. A *capacitor* is a simple electrical device that is capable of storing a charge of electrons.

This time Tutor tackles how computer memory works and comes up with an explanation that you don't need an electrical engineering degree to understand.

A *transistor* is a miniature electronic switch that can be opened or closed by raising or lowering an input voltage. A transistor is composed of precisely patterned layers of silicon, polysilicon, and oxides just a few microns (millionths of a meter) wide. Figure 1 illustrates how a transistor works schematically. When the input voltage to the transistor is turned off, the switch is *open* and no current flows through the wire connecting the positive terminal to the negative terminal. When the input voltage is turned on, however, the switch *closes* and current is permitted to flow. By controlling the voltage input to the transistor, therefore, one can control the flow of electrons from one part of a circuit to another. Some transistors exhibit exactly the opposite characteristics, permitting current to flow when the input voltage is off and impeding the flow when voltage is applied. We're only concerned with the former type of transistor, which is officially known as an NPN transistor. The N and P refer to the types of silicon used in the transistor: N for negative-doped silicon and P for positive-doped silicon.

Figure 2 shows a schematic representation of a simple one-cell DRAM consisting of a transistor and a capacitor. The horizontal line at the top of the figure represents a *word line*, which is initially held at a low voltage. Because the word line is connected to the input of the transistor, raising the voltage will activate the transistor and close the switch connecting the capacitor to the vertical line representing one of the cell's two bit lines. The bit lines are connected through a buffering and amplifying circuit to an output line (OUT) whose potential, which is typically 0 or 5 volts, signifies a binary 0 or 1 to the computer.

This simple circuit is capable of storing one bit of data. The bit's value is represented by the charge (or lack of charge) in the capacitor. A charge in the capacitor represents a 1, while no charge represents a 0. Reading the bit's value from the circuit is a two-step process: First, a precharge circuit connected to the bit lines charges both lines to an equal reference voltage, usually 2.5 volts. Then the word line is activated, which closes the transistor and forms a connection between the capacitor and one of the bit lines. If the capacitor is charged, the voltage of the bit line that the capacitor is now connected to rises ever so slightly. The voltage of the other bit line remains the same, and the positive differential between the bit lines drives a 1 (high voltage) on the output line. If the capacitor is uncharged, the bit-line voltage decreases

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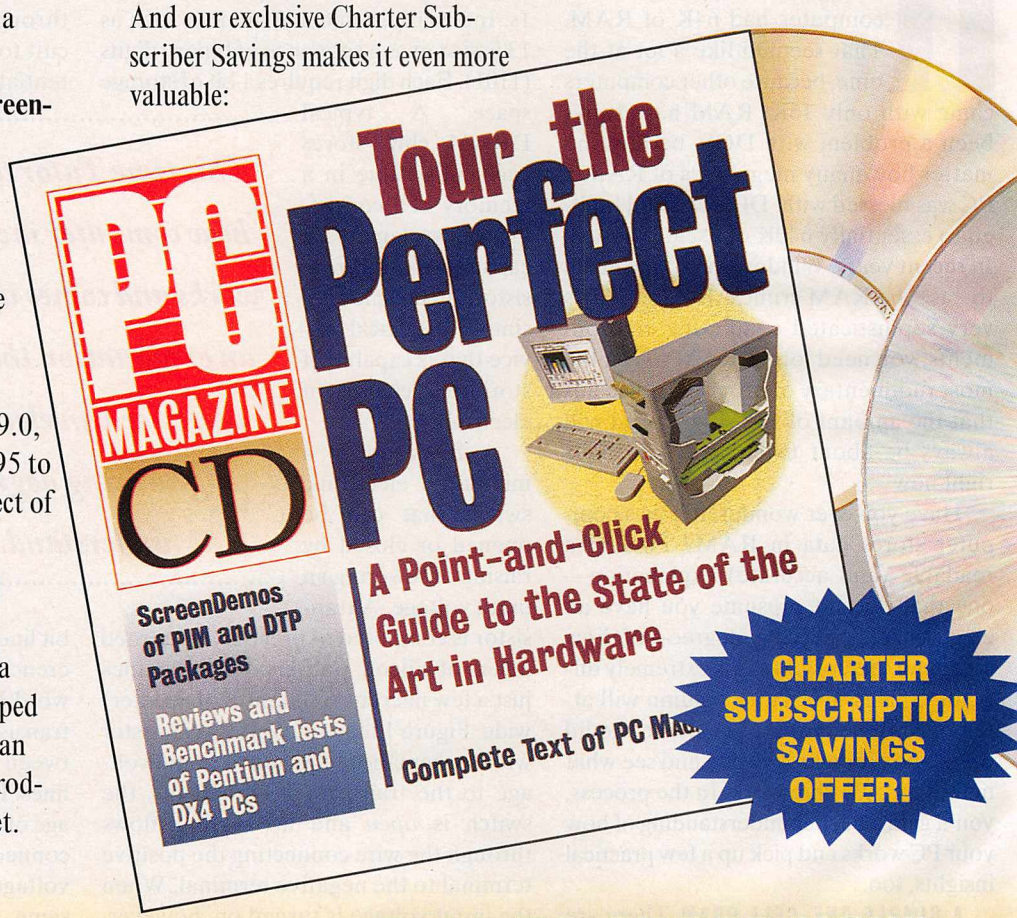
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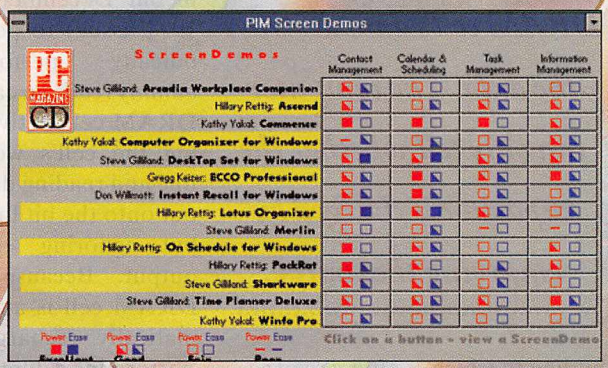
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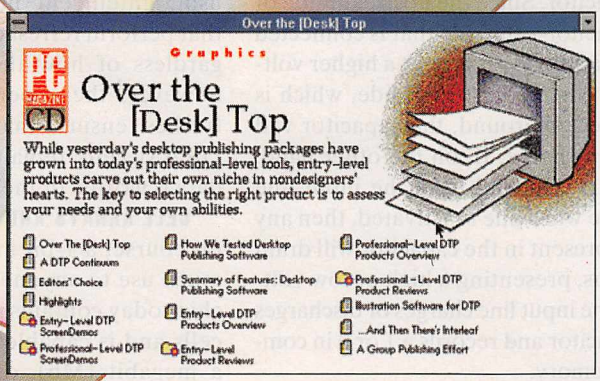
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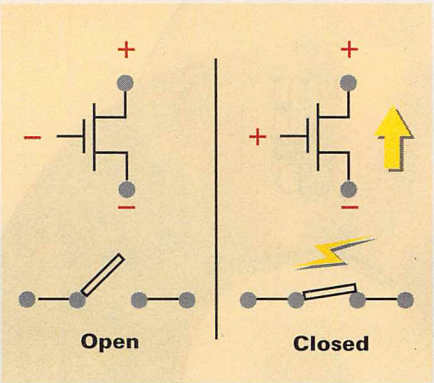


Figure 1: **A transistor in a computer circuit acts as a miniature switch, controlling the flow of electrons from one location to another. Applying a voltage to the transistor *closes* the switch and completes the circuit, while removing the voltage *opens* the switch and shuts off the flow of electrons.**

when some of the charge flows out of the line and into the capacitor. This induces a negative differential between the bit lines and produces a 0 (low voltage) on the output line.

In the past, you may have heard terms such as *memory access times, cycle times,* and *precharge times* used to characterize DRAM chips. A finite amount of time is required to precharge the bit lines prior to accessing the cell, and additional time is required for the output to appear on the output line after precharging is complete and the word line is activated. These time intervals are referred to as the memory cell's precharge time and access time, respectively. Cycle time is the sum of the precharge time and access time. A typical RAM chip has an access time of 100 nanoseconds (1 nanosecond equals one-billionth of a second) and a precharge time of 80 ns. Barring the presence of special design enhancements that may be used to reduce the effective cycle time, such a chip cannot be read or written more often than every 180 ns.

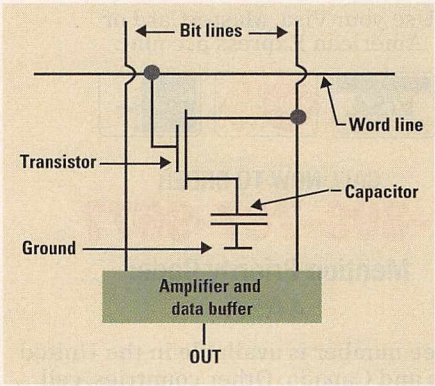


Figure 2: **A simple 1-bit DRAM cell consists of a capacitor and a transistor. A charge in the capacitor represents a 1, while a lack of charge represents a 0. Applying a voltage to the word line closes the transistor, connecting the capacitor to the right-hand bit line. This produces a small voltage difference between the left and right bit lines and results in the cell's value being read to the output line.**

Writing a 1 or 0 to the DRAM cell is the reverse of the read process. Some DRAM chips provide separate lines for data input and output. Others use the same line or set of lines for input and output, in which case we can refer to these lines simply as *data lines*. On data lines, an output line becomes an input line through which a bit can be presented to the memory cell. To write a 1 to the cell, the computer would place a voltage on the input line to charge the bit line to which the transistor is connected and activate the word line. This completes a circuit to the capacitor. Since the upstream side of the capacitor—the side that is connected to the transistor—is now at a higher voltage than the downstream side, which is connected to ground, the capacitor will acquire a charge. If, on the other hand, voltage is removed from the input line while the word line is activated, then any charge present in the capacitor will drain out. Thus, presenting a high or low voltage on the input line charges or discharges the capacitor and records a 1 or 0 in computer memory.

One problem with capacitors is that reading a DRAM cell's data destroys the data. The computer can only tell whether the capacitor is charged by emptying the charge.

One of the problems with using capacitors for data storage is that reading data from a DRAM cell destroys the data. The computer can only tell whether the capacitor is charged by emptying the charge onto a bit line. If the capacitor was charged before, it will no longer contain a charge after it's read. Therefore, DRAM chips are designed so that when a 1 is read out of a capacitor, that capacitor is immediately recharged.

Another problem that arises when capacitors are used for data storage is that no capacitor will hold a charge forever. The tiny capacitors used in DRAM cells will hardly hold a charge for any time at all. A DRAM cell must be refreshed (recharged) every few milliseconds, or a 1 will change to a 0 as a result of leakage. Computers use many techniques to refresh DRAM cells. One commonly used technique, and the one that was employed on early IBM PCs, involved dedicating one system timer and one DMA channel (for more information on DMA, or direct memory access, see the Tutor column in our December 5, 1994, issue) to periodically perform *dummy reads* on each DRAM cell, activating the cell's word line and reading data out onto the bit lines but ignoring the output. Because a DRAM cell is automatically recharged after a read access, performing a dummy read is an easy way to recharge it. Newer PCs do this in a more elegant fashion, using intelligent memory subsystems that perform refreshes on their own. Regardless of how they are performed, however, these periodic memory refreshes ensure that data written to DRAM cells remains there until new data is written or the PC is turned off.

CELL ARRAYS AND CHIP ORGANIZATION

Of course, a 1-bit memory cell isn't of much use to anyone. A typical DRAM chip today contains millions of memory cells and is capable of holding at least a megabit (Mb), or 1,048,576 bits of data. These cells are organized into arrays of rows and columns, as shown in Figure 3. All of the cells in one row of the array share a common word line, and all of the cells in one column share a common pair of bit lines. Each bit, or memory cell, is identified by a row and column address.

To read a particular bit in the array,

the computer provides an address that is broken down into a row and column address by a memory controller outside the DRAM chip. The memory controller passes these addresses sequentially (row first, column second) to the chip, and the chip's row and column decoders activate the corresponding word and column lines. Activating a word line reads every memory cell along that row, causing each to charge the bit lines that it is connected to. Activating a column line establishes a physical connection between the bit lines leading from the targeted memory cell and the bit lines leading to the data buffer (see Figure 3), causing the value in that memory cell to appear at the output. The connection is made by activating a pair of transistors in the block labeled "column gates" to form a path through which the electrons can flow.

It is precisely this type of arrangement that is used in the common 1Mbx1 DRAM chip. This chip contains 1,048,576 individual memory cells arranged in 1,024 rows and 1,024 columns. (The chip designer may choose another organization, such as 512 rows and 2,048 columns. However, it is generally advantageous to make the array as "square" as possible to minimize the number of address lines required and reduce the chip's size.) The designation "1Mbx1" specifies the chip organization and indicates that the chip contains 1,024 × 1,024 (1,048,576) words and each word is 1 bit in length. Thus, the chip can hold 128 kilobytes (128K) of data (1 byte equals 8 bits), and each bit can be accessed individually.

The 256Kbx4 chip is another common DRAM chip that holds 128K of data. In this case, the chip contains 256 × 1,024 (262,144) words of 4 bits each. This chip contains four output lines, not one, so a single read requiring just one row and column address produces 4 bits of output. With this setup, memory cells can't be accessed individually; they must be accessed in units of four. Internally, a DRAM chip that utilizes 4-bit words typically stores the memory cells in four or more separate subarrays to facilitate simultaneous access to each. Likewise, it contains four separate data buffers: one for each of the four output lines.

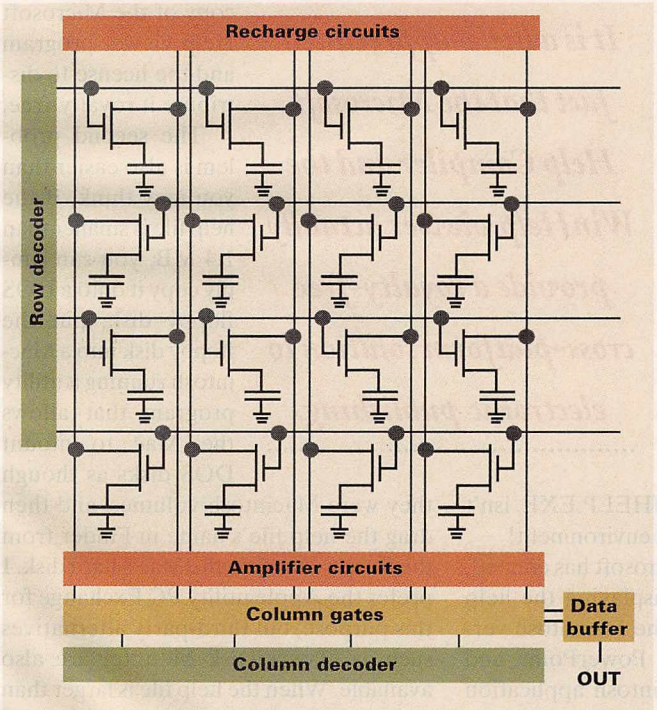


Figure 3: **DRAM chips organize memory cells into row and column arrays to facilitate access to individual cells. To read or write a cell, a memory controller supplies a row and column address. Decoders inside the chip translate the addresses and activate the corresponding word and column lines.**

Does the chip organization matter when you add a new DRAM chip to a device such as a memory card or video adapter? It certainly does. A typical 512K Super VGA card uses four 256Kbx4 chips. This provides a total of 512K of video memory, and using four individual chips with four data lines each allows the card's designer to establish a 16-bit connection between the processor and the video adapter. While four 64Kbx4 chips would probably work (you'd still have a 16-bit connection, but only 128K of video memory), four 1Mbx1 chips would not fill the bill. You'd have 512K of RAM on board, but only four data lines. A RAM subsystem with 4 data lines won't work in a system designed for 16. And even if it did work, a 4-bit connection would be a slow connection indeed.

The practical effect of all this is that you can't just pick a DRAM chip off a shelf and expect it to work wherever you plug it in. When you're upgrading the RAM in a PC or on an adapter card, it's important to purchase chips that meet the manufacturer's criteria. And in addition to chip organization, you must also consider access time. If a PC calls for, say, 100-ns DRAM, then 150-ns DRAM, which may be attractive because it's cheaper, will most likely not work. It's okay to use DRAM chips with lower—that is, faster—access times than those called for. A PC that requires 100-ns DRAM will work fine with 80-ns chips, but the faster chips will not deliver a speed boost. The PC will still operate as if you had installed 100-ns DRAM.

STATIC RAM SRAM designs are similar to DRAM designs except that the value of a bit stored in a memory cell is represented by the state of a flip-flop instead of the charge in a capacitor. A flip-flop is an arrangement of transistors and resistors forming a small electronic switch that can be toggled on and off and that holds its state as long as power is applied. Unlike DRAM cells, SRAM cells contain no capacitors and do not require continual recharging. They also have quicker access times than DRAM cells because a flip-flop induces a greater potential difference between the bit lines. But the greater complexity of an SRAM cell (four transistors and two resistors as opposed to one transistor and one capacitor) means SRAM is more expensive to produce and capable of less storage capacity per square inch.

ACCESS THE TUTOR If you like what you read here, let me know by sending me a note on PC MagNet (preferably in the Tutor section of the Utilities/Tips Forum; type GO ZNT:UTILFORUM to get there). If response is sufficient, I'll follow up with additional columns explaining how logic gates are formed from transistors and how different gates can be combined to allow a computer to add, subtract, and perform other operations. □

Power Programming

BY RAY DUNCAN

Electronic Publishing with Windows Help

It feels good to catch the crest of a wave once in a while, even if it happens completely by accident. My last contributions to *PC Magazine* consisted of an eight-part series on the design and creation of Windows help files (the Power Programming columns from April 27 through September 14, 1993). This subject previously had been almost totally ignored by DOS- and Windows-programming magazines alike. Whether this series helped provoke an explosion of interest in this important area or merely foreshadowed one, I cannot say. But it has been gratifying—and somewhat astonishing—to see the number of help file–related articles, books, and authoring tools that have appeared over the last two years. (For an overview on adding help to your Windows app, see Neil J. Rubenking's article "The Structure of a Help System" in the Extending Your Apps column in our issue of December 20, 1994.)

I must confess that at the time of writing those columns, I too was new to Windows help files and to electronic publishing in general. I was learning most of what I wrote about as I went along—and was severely disappointed at the lack of documentation (by Microsoft or anyone else) concerning help file authoring techniques, the internal structure of help files, or the capabilities of the help file compiler and viewer. Now that I'm in a somewhat more luxurious position in terms of both level of experience and availability of information, I plan to revisit the subjects of Windows help files and electronic publishing for several installments before moving on to other topics.

GOING CROSS-PLATFORM It is a little-appreciated fact that the Microsoft Help Compiler and the WinHelp viewer actually provide a royalty-free cross-platform solution to electronic publishing—if, of course, the only platforms you are interested in addressing are Windows, Windows NT, OS/2, DOS, and the Macintosh. The Windows NT and OS/2 aspects are fairly obvious—if Windows NT and OS/2 can run Windows programs in general, then they can certainly run WINHELP.EXE and can be used to view Windows help files. A DOS viewer for help files is available for downloading from ZiffNet's PBS Utilities+ Forum in the file ZHVIEW.ZIP. But what about the Macintosh? Obviously WINHELP.EXE isn't going to execute in that environment!

It is a little-appreciated fact that the Microsoft Help Compiler and the WinHelp viewer actually provide a royalty-free cross-platform solution to electronic publishing.

It turns out that Microsoft has created, for the purposes of displaying the help files that accompany the Macintosh versions of Word, Excel, PowerPoint, and FoxPro, a native Macintosh application called (naturally enough) Microsoft Help. The Macintosh Microsoft Help program looks and behaves almost exactly like WINHELP.EXE and can display the very same help files, if you can live with—or work around—occasional odd font mappings and aberrant displays of Windows bitmaps (see Figures 1 and 2). So, should you decide to base a cross-platform electronic publishing project on Windows help files, you just have to solve two logistical problems: making sure that your potential Macintosh users have a copy of the Microsoft Help viewer program, and getting the compiled .HLP file from the DOS/Windows environment to the Macintosh environment.

The first problem is relatively easy to solve. Since Word, Excel, and PowerPoint are each dominant players in their market segments on the Macintosh, you can be pretty sure that any active Macintosh user is going to have a copy of at least one of those applications, and thus will also have a copy of the Microsoft Help viewer program on his hard disk somewhere (typically with the canonical pathname System Folder:Extensions:Microsoft:Help:Microsoft Help). If you want to make absolutely sure that the end user is going to have the help file viewer available, you can buy the Macintosh version of Microsoft FoxPro Professional, which includes (among other things) a copy of the Microsoft Help viewer program and the license to distribute it royalty-free.

The second problem is also easier than you may think. If the help file is smaller than 1.4 MB, you can simply copy it onto a DOS floppy disk, put the floppy disk into a Macintosh running a utility program that allows the Mac to mount DOS disks as though they were Macintosh volumes, and then drag the help file's name in Finder from the floppy disk onto the Mac's hard disk. I prefer the Apple utility PC Exchange for this purpose, but third-party alternatives such as Dayna Disk Mounter are also available. When the help file is larger than 1.4 MB, you will probably find it most efficient to transfer the file over a network via a file server or as an e-mail attachment. One of the fringe benefits of the rapid proliferation of the Internet is that it has made this sort of cross-platform file transfer very

easy using FTP servers and clients.

Once the help file has been brought into the Macintosh file system, you will want to give it a longer, more descriptive name and attach a custom icon to it. The Macintosh has supported 32-character, mixed-case filenames since its earliest days, and Macintosh users understandably find DOS-style 8.3 names primitive and repugnant. The icon portion of the task is easily accomplished by drawing a suitably sized image or logo in any Mac paint program, copying it to the system clipboard, and then pasting it into the icon portion of the Macintosh Finder's Get Info window for your help file.

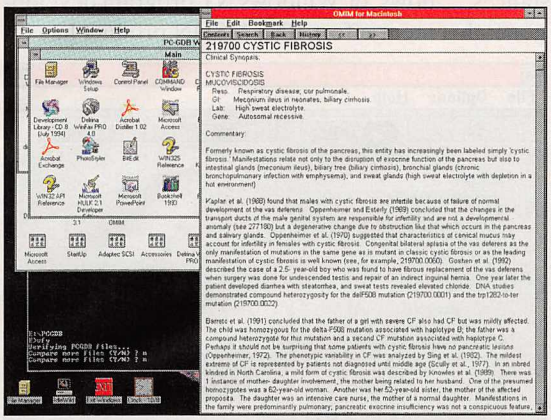


***Figure 1:* This help file is displayed with the Windows help viewer (WINHELP.EXE). This happens to be a page from a very large (25MB) and equally famous genetics reference text, *Mendelian Inheritance in Man* (MIM) by Victor McKusick.**

You will also need to mark the help file with the proper type and owner information, so that the Macintosh Finder will know what application program should be launched to open or print the file when a user double-clicks directly on the help file's name or icon. PC Exchange can be configured to mark the file appropriately when the file is transferred from the DOS media to the Mac media, but you can also use the inexpensive Macintosh utility ResEdit for this purpose. In the latter case, force the file type to "HELP" and the file-creator identifier to "MSHE."

BEYOND THE VALLEY OF WINHELP The Microsoft Help Compilers (HC31.EXE and HCP.EXE) and help viewer (WINHELP.EXE) are fine tools in many ways, and you sure can't beat the price, but you will quickly become aware of their inherent limitations when you start to work on electronic publishing projects on a more grandiose scale. They don't handle bitmaps very well, they don't handle 256-color bitmaps at all, the creation and placement of custom graphics and hot spots is slow and painful, indexing must be done explicitly and is increasingly prone to inconsistencies and omissions as the amount of source text grows, the default menu items and default buttons on the button bar cannot be reconfigured or deleted, the WinHelp API function for use by external programs is relatively spartan. . .you get the idea. As it turns out, Microsoft sells a perfectly wonderful solution to these problems called the Multimedia Publishing Toolkit, although its marketing of the toolkit has been so halfhearted that hardly anyone knows about it.

I first became aware of the Multimedia Publishing Toolkit when I fetched up against a seemingly insurmountable brick wall in one of my own little ventures. I had decided (don't ask me why now!) to try to use the Microsoft Help Compiler and help viewer in electronically publishing a massive medical-genetics reference book called *Mendelian Inheritance in Man* (MIM) by Victor McKusick. I was able to obtain the full text of the book (25MB, or roughly 1 million words) over the Internet and quickly wrote a program to convert the original text into a properly tagged RTF file that could be fed to the help compiler, but I was then stymied by the indexing problem. Manual editing of the RTF file to attach keywords was clearly out of the question; aside from the sheer volume of text, I wanted to end up with a fully automated process so that I could rebuild the help file quickly whenever the original text was updated.

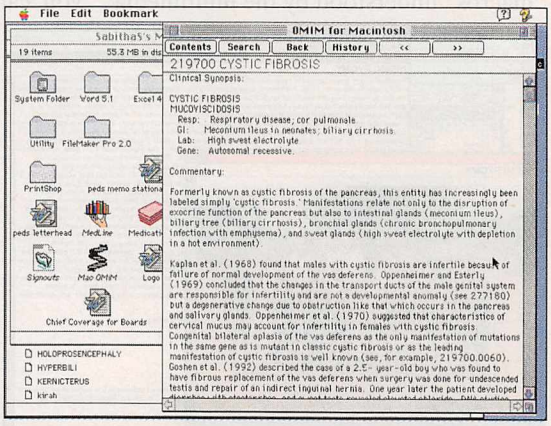


***Figure 2:* The same page from the *Mendelian Inheritance in Man* help file, displayed on a Mac using the native Macintosh version of the Microsoft help viewer program.**

I considered writing another custom program to produce an inverted index of the original text. Then I would convert the inverted index into keyword footnotes that could be inserted into the RTF file during the translation process. But I decided to defer this solution as a last resort, since I had become too old and jaded to enjoy reinventing the wheel. I investigated other search engine, hypertext, and viewer products, but all of them required royalties or had licensing constraints of some kind—a situation I was highly motivated to avoid, since I wanted the final electronically published book to be unencumbered. I looked particularly carefully at Adobe Acrobat and ran some preliminary trials with it on both the Windows and Macintosh platforms, but I finally decided not to use it because of the per-user charge for the viewer program (a charge that is going to disappear, incidentally, in the forthcoming Adobe Acrobat 2.0).

Then one day, as I was browsing through the technical notes on the Microsoft Developer Network (MSDN) CD-ROM looking for something else, I stumbled across a chance reference to the fact that the Multimedia Viewer includes full support for full-text searches. I knew next to nothing about the Multimedia Viewer, other than a vague awareness that it was the underlying technology for Microsoft products such as Encarta, but it seemed like it was worth a shot. So I called up Programmer's Connection, gave them my credit card number, and by the end of the next day, I was holding in my hands the Multimedia Publishing Toolkit. Within 10 minutes of the time I opened the box, I was kicking myself because it was clear that I had—quite by dumb luck—found the solution to nearly all my problems.

What is the Multimedia Publishing Toolkit? It's a collection of tools and utilities on a CD-ROM, including bitmap,

sound, and video editors; the multimedia compiler and viewer; various DLLs; a great deal of sample code and text files; and four manuals both in printed and online form. Conversion of an existing Windows help file project into a multimedia viewer project is almost effortless—the multimedia compiler accepts RTF files and topic/keyword/title coding that is nearly identical to that accepted by the Microsoft Help Compiler, and the project control file (.HPJ for the Microsoft Help Compiler, .MVP for the multimedia compiler) is very similar as well. And the multimedia viewer (MVIEWER2.EXE) and its support DLLs can be freely distributed, along with your compiled multimedia help file, without any royalty or license fee.

Once you've converted your electronic publishing project from the Windows help system to the multimedia viewer system, of course, many new options are open to you even though you are not obligated to use them. 256-color bitmaps are fully supported and can be automatically dithered for 16-color systems. Full-text searches with Boolean expressions are available, and topics can be grouped into "categories" that can be searched independently. Video and sound clips can be added, and existing QuickTime video segments can be converted. The repertoire of "macros" understood by the multimedia viewer is significantly expanded. Window, menu, and button control are similarly enhanced compared with the capabilities of WINHELP.EXE. Figure 3 shows my own project after it was converted for the multimedia viewer and integrated with scanned photographs.

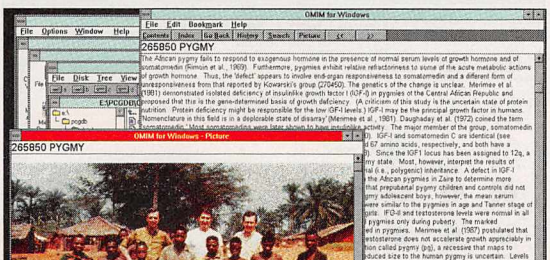


***Figure 3: Mendelian Inheritance in Man* after it had been converted to the multimedia viewer platform and integrated with photographs.**

Other nice aspects of the multimedia toolkit: The documentation is actually readable and relatively complete, the multimedia viewer can display multiple files at once without loading multiple instances, the bitmap editor is an excellent general purpose tool, the multimedia compiler is Windows-based and can run politely in the background while you are working with other Windows apps, and the configuration and building of a multimedia file are controlled by a convenient Windows-based project manager. The multimedia viewer API, which provides for control of the viewer by external programs, is very elaborate and among other things allows the calling program to steer the viewer by specifying a context string directly (WINHELP requires integer IDs that are synchronized by MAP entries in the .HPJ file—another WINHELP bookkeeping problem and opportunity for error).

What's the downside of the multimedia toolkit? Well, on paper it puts another $495 in Bill Gates' pocket, an unattractive notion at best, although if you shop around you can probably find the multimedia toolkit for a price more on the order of $300 to $350. The multimedia files with full-text indexing are, as you might expect, quite a bit larger than a corresponding Windows help file—typically twice the size, even with the high-compression option turned on. The need to install the multimedia viewer and its support DLLs in the appropriate directories on the end user's system, in addition to your compiled multimedia file, means that you will finally have to tackle the issue of using a Windows-based setup or installation program. Lastly, there's no cross-platform support for compiled multimedia files at the present time, although the recent release of Microsoft Encarta and Cinemania on the Macintosh might lead us to hope that a Macintosh version of the multimedia toolkit will appear.

THE MSDN CD-ROM I know I've harped on this topic before, but I must emphasize once again the extreme importance of subscribing to the MSDN CD-ROM if you are involved in any type of DOS, Windows, or Windows NT program development effort. The MSDN product has recently been broken into two levels. Level 1 is delivered quarterly on a single CD-ROM, costs about $200 per year, and contains several important Microsoft Press programming books, the manuals for all Microsoft programming languages and APIs, zillions of technical notes and specifications, the complete back issues of Microsoft Systems Journal, and piles of sample source code. Level 2 costs about $500 per year and includes everything that is on Level 1 plus the complete battery of Microsoft SDKs and DDKs and the current versions of all Microsoft operating systems on a whole fistful of CD-ROMs totalling about 5 gigabytes each quarter.



***Figure 4:* Microsoft Help Universal Kit, Version 2.1, or HULK, is a suite of programs driven by your help file's master project (.HPJ) file.**

On a per-byte basis or any other way you want to look at it, the MSDN CD-ROM subscription is one of the great bargains of all time and will pay for itself the first time you use it. With respect to help file development, the MSDN CD-ROM contains a number of important components. First, it contains help-authoring templates for both WinWord 2.0 and WinWord 6.0; these are analogous to (although simpler than) commercial help-authoring products like RoboHelp and consist mainly of macros to assist you in creating help file topic labels, keywords,

browse sequences, and hyperlinks. Second, it contains an on-line book called the Windows Help Authoring Guide (WHAG), an unofficial but quite valuable manual on various aspects of help file construction. Third, the Level 2 MSDN contains the beta release of MediaView, the next generation of the Microsoft Multimedia Toolkit.

Last but not least, the latest edition of MSDN contains an interesting unsupported tool called Microsoft Help Universal Kit, Version 2.1, or HULK. HULK is actually a suite of programs, integrated through a control panel, written in Visual Basic, and driven by your help file's master project file (.HPJ file). Like many of the commercial help file authoring tools, HULK will help you edit bitmaps and hot spots, compile and instrument help files, and perform a number of other routine chores. But HULK also has some powerful help file analysis capabilities that are unique as far as I know. HULK scans the RTF source files for your help file project, extracts all the context strings, topic titles, keywords, and hyperlinks, puts all these into a Microsoft Access database, and then applies referential integrity tests as well as generating various sorted listings. This is extremely valuable when you are developing very large help file projects based on dozens of source files and containing thousands of individual topics and hyperlinks.

OTHER OBSCURE RESOURCES For the Internet-aware, there are two venues for discussion of help file development. If your access to the Internet is limited to e-mail (for example, if you dial up a commercial on-line service such as MCI Mail that has an Internet gateway for e-mail as a fringe benefit), you can sign up for the WINHLP-L mailing list. Send an e-mail message to LISTSERV@ADMIN.HUMBERC.ON.CA with "SUB WINHLP-L YOUR NAME" in the body of the message. If you have a full-fledged Internet connection and the appropriate news reader client software, you can also join the UseNet newsgroup named "comp.os.ms-windows.programmer.winhelp." Both of these forums are very active, and (unlike many mailing lists that are reflected to UseNet newsgroups or vice versa) they have virtually no overlap.

I also want to mention two important articles that appeared last year and broke open Microsoft's proprietary .HLP file format once and for all, paving the way for the emergence of third-party .HLP file compilers and viewers. "Documenting Documentation: The Windows .HLP Files Format" by Pete Davis was published in two parts in the Undocumented Corner column of *Dr. Dobb's Journal,* September and October 1993. These articles explained the internal file system and compression scheme used in .HLP (and .MVB—Multimedia Viewer) files and included sample C code for decoding and dumping the contents of an .HLP file directly.

THE IN BOX Please send your comments and suggestions to me at any of the following e-mail addresses: PC MagNet: 72241,52; MCI Mail: RDUNCAN; Internet: DUNCAN@CERF.NET. □

RAY DUNCAN IS A CONTRIBUTING EDITOR OF *PC MAGAZINE.*

MOVING?

Please write to: PC Magazine, P.O. Box 54093, Boulder, CO 80322. Include your mailing label from a recent issue of PC Magazine for faster service. Please allow up to 60 days for change of address to take place.

Utilities

BY MICHAEL J. MEFFORD

SHRED Private Disk Files

Shredding outdated documents of a sensitive nature is common practice for employees of the government. Where confidentiality is important, a shredding machine is as necessary a piece of office equipment as a filing cabinet. Running printed copies of data through a shredder is one of the more efficient ways to ensure that data does not get into the wrong hands.

The paperless office is closer to reality thanks to the computer. Paper copies, if any, are often just for backup purposes. More and more sensitive data can be found on disk media. One would think ensuring that outdated disk data does not reach snooping eyes would be much easier than shredding hard copies: merely delete the file.

Deleting a disk file, however, does not destroy the file's contents; only the file index system is changed. You might think of file deletion as removing the label from a folder's tab in the hopes that no one will find the folder. The DOS kernel can no longer find the data, but for utilities like DOS's Undelete or Norton's UnErase, it's an easy task. You won't sleep very well with that kind of security system.

It's true that once a file is deleted, the disk space becomes available for other files. But until you write over it with a new file, the old file is subject to prying eyes. Even after a disk-write, you still are not assured the erased file will be written over by the new file. Starting with DOS 3.0, DOS looks for empty disk space starting after the last-written sector, making it unlikely that a newly written file will overwrite space used by a just-deleted file. Formatting a disk doesn't destroy the data sectors either, unless you use the /U (unconditional) option or do a low-level format. What is needed is a way to shred a disk file the same way a paper shredder destroys documents. This issue's utility, SHRED, fills that gap.

You can get SHRED and its assembly language source code either by mail or by downloading the files from *PC Magazine*'s PC MagNet. Refer to the sidebar "Guide to Our Utilities & How to Get Them" for the details.

USING SHRED SHRED ensures confidentiality by writing zeros over sensitive unwanted data. SHRED works in two ways: shredding existing unwanted files or shredding the data of files that have already been deleted. The syntax for SHRED is

```
SHRED [d:] [filespec] [/S] [/F ¦ /D]
 [/C]
```

I'll explain the optional switch parameters in a moment. The easiest way to use SHRED is to follow SHRED with the name of the file you wish destroyed in the same manner as you would with the DOS DEL or ERASE command. Include a path if necessary. Before shredding, the filename will be displayed complete with its vital statistics (size, date, and time) in the same format as the familiar DOS DIR command. You will then be asked to confirm your intention to shred the file. With a press of "Y" followed by Enter, the file will be entirely written over with zeros and then deleted from the directory. A press of "N" will spare the file from Never-Never Land. Pressing either Esc, Ctrl-Break or Ctrl-C is your rip cord to abort the process and return you quickly to the DOS prompt. Shredding a file named SECRET.TOP is as easy as entering

```
SHRED SECRET.TOP
```

Like DOS, SHRED will recognize the wildcard characters (question mark and asterisk). You can shred an entire directory by tacking star-dot-star (*.*) onto the path or just by naming the target directory. For example, to shred all the files of a directory named TEMP, you would enter either

```
SHRED TEMP\*.*
```

or

```
SHRED TEMP
```

The filenames of all the files in TEMP will be displayed one at a time and you will be given the opportunity with each to vote yea or nay to shredding them. To suppress confirmation before shredding, add the /C switch. For example,

```
SHRED TEMP /C
```

will shred all the files in the TEMP directory without prompting for approval. The filenames will be displayed as they are shredded, but there will be no pause for confirmation between shreddings. Use this option with caution! As a safeguard with the /C option, SHRED will terminate shredding if any keypress is detected, but only after the current file is shredded.

For your protection, SHRED will not

Top 10 Utilities

Rank	Utility
1	**MYGRPS** - *Customizes group icons*
2	**WPNTR** - *Highlights Windows presentations*
3	**WINCMD**- *Command file interpreter*
4	**WTIME** - *Keeps PC clock accurate*
5	**FINDIR** - *IRQ line analysis*
6	**MONTOR** - *Monitors system resources*
7	**BAT2EX** - *Compiles batch files*
8	**INCTRL** - *Controls Windows installation*
9	**BUGS** - *Windows 3.1 screensaver*
10	**CONFIX** - *Issues commands at boot time*

This list is based on the total number of downloads each utility has had on PC MagNet over the past month. To download these files, type GO ZNT:TIPS. For more information, see the sidebar "Guide to our Utilities & How to Get Them."

touch hidden or read-only files such as IBMBIOS.COM or IBMDOS.COM. If you wish to shred any of these files you will have to first change their attributes with the DOS ATTRIB command.

SHRED will traverse the directory tree below and include the indicated starting directory if you add the /S subdirectory option. For example,

```
SHRED TEMP /S
```

will shred all the files in the TEMP directory and all the files in all of TEMP's subdirectory branches. Since all subdirectories are a branch of the root directory, you can shred all the files of the current disk by entering

```
SHRED \ /S
```

Of course, you should indicate the drive you wanted shredded if it is other than the current default drive.

The /D option deletes the filespec without writing zeros over the file—effectively doing the same thing as the DOS DEL or ERASE command. The /D option works nicely in concert with the /S option. For example,

```
SHRED \TEMP /D /S
```

will delete all the files in TEMP and all the files in any subdirectories beneath TEMP, without your having to enumerate each subdirectory as you do with the DOS deletion commands. You will be given the opportunity to pardon individual files as SHRED asks for your confirmation. Add the /C parameter and you can swiftly delete all the files with one command. (This works similarly to DOS's DELTREE command, but differs in that DELTREE deletes the subdirectories themselves and does not ignore read-only files.)

The last option, /F, shreds all the free data space of a disk. That is, all the disk clusters not currently used by files will be shredded, but no existing file's data will be touched. As when shredding files, SHRED will prompt you before continuing with the job unless you add the /C switch.

The purpose of the /F is to shred the data of files previously deleted using the DEL or ERASE commands. Remember, the reason for SHRED in the first place is that deleting files does not destroy the data. Shredding the free space of a disk shreds the data of those deleted files. If no filespec is entered or if only a drive parameter is entered, SHRED assumes /F mode. For large disks with lots of free space or slow floppy disks, shredding free space can take a while. Have patience. For example, entering

```
SHRED /F
```

will shred all the free space of the default drive. Entering

```
SHRED \ /S /F
```

will shred the entire disk by first shredding all the free space of the default drive and then all the files of that disk.

You can use most of the switches in combination. The only combination that doesn't make sense is /D with /F. If /D (delete without shredding) is entered with /F, the /F is ignored.

The only caveat about using SHRED is the obvious: Do not use SHRED if there is the slightest possibility that you might want to recover a file with an unerase utility. Once zeros are written over the data there is no hope for recovery without the use of sophisticated, special-purpose hardware. Even undelete utilities that move deleted files to a hidden holding area (such as DOS's Undelete in Delete Sentry mode) will not be able to undelete shredded files. This is because the files are overwritten with zeros *before* they are deleted, so the file that gets moved to the hidden directory has already been wiped out.

SHREDDING GHOSTS Although SHRED will provide security against undeletion by software methods, it is not completely secure if you have access to special hardware designed to recover lost files. Because of this, the government's requirements for wiping a disk file involve overwriting the file seven times. You alternately overwrite with 1-bits and 0-bits three times, and then overwrite with the value F6h. The ASCII equivalent of F6h is the horizontal bar division symbol—the character FORMAT uses to fill newly formatted floppy disks. The final pass verifies the F6h write.

The government requires multiple writes because ghosts of previous disk contents are detectable with special hardware after up to seven overwrites. Data is stored on disk as "pulses" of magnetism which are analog, not digital. Disk drives convert the pulses to digital form—ones and zeros. The hardware designed to recover data reads the disk as a waveform. It converts the current digital contents of an area of the disk to a sharp-edged waveform and "subtracts" it from the actual waveform. Then it amplifies the difference to obtain the *previous* contents of that area of the disk.

Norton's WipeInfo utility meets the government's standards for providing security against undeletion. SHRED won't protect your disk media from a concerted effort with the aid of sophisticated hardware, but its protection against software deletion is sufficient for most purposes.

HOW SHRED WORKS One of the first things SHRED does is parse the filespec into its two parts: the path and the filename. The reason for this is the format of some of the DOS INT 21 function calls. SHRED is ultimately interested in opening the file (or files, if wildcard characters are included) described in the filespec so it can write the zeros to it. If the file resides somewhere other than the current default directory, you have to tell DOS the complete path to the file so it can find and open it.

The first wrinkle is dealing with filespecs that contain wildcard characters. For example, if the filespec is C:\TEMP*.*, the star-dot-star part must first be resolved into the specific filenames that are in the TEMP directory. For that, DOS provides the Find First/Next, 4Eh/4Fh pair of functions that search the TEMP directory and return the filenames, one at a time. The calls return the same file information that you get with the DOS DIR command, namely filename, size, and date, but they don't return the path.

That means one of two possible steps must be taken before the file can be opened. The first approach is to remove the star-dot-star from the path and tack on the filename returned by Find First/Next. A second approach is to change the current directory to that indicated by the path. In the former approach, the DOS file open call is passed a constructed path\filename, and in the latter approach, just the filename is passed.

I find the second approach—changing

```
Definitions
===========
DELIMITER            = rightmost character that is either a ":" or a "\"
CHAR_AFTER_DELIMITER = character that follows DELIMITER
LAST_CHAR            = rightmost character in the filespec
NEXT_LAST_CHAR       = next to rightmost character in the filespec
ROOT                 = flag indicating if path is a root directory

Code
====
if DELIMITER = "\" and (NEXT_LAST_CHAR = ":" or NEXT_LAST_CHAR <= space) then
    ROOT = TRUE
    perform change directory
              (e.g. C:\ or C:\TEMP.TXT or \ or \TEMP.TXT)


if ROOT <> TRUE and DELIMITER = "\" and LAST_CHAR = "\" then
    filespec is a path without a filename, so
    remove the trailing "\", perform change directory,
    and use "*.*" for filename
              (eg. C:\TEMP\ becomes C:\TEMP)


if a DOS Change Directory (fctn 3Bh) on the filespec returns TRUE then
    filespec is a path (and directory has been changed),
    use "*.*" for filename
              (eg. C:\TEMP)
else
    filespec includes a filename, so to isolate the path
    temporarily separate the filename from the path with a zero
    using the following rule:

    if ROOT = TRUE then
          save CHAR_AFTER_DELIMITER, change CHAR_AFTER_DELIMITER to zero,
          and change directory to path
              (eg. C:\filename becomes C:\Øilename)
    else
          save DELIMITER, change DELIMITER to zero,
          and change directory to path
              (eg. C:\TEMP\filename becomes C:\TEMPØfilename)

    then perform change directory, and
    change zero back to original character
```

Figure 1: **SHRED identifies the path and filename portions of the filespec and makes the path the default directory. The file can then be opened without constructing a complete path\filename.**

the default directory to the path and passing just the filename—the easier of the two. I'll show the algorithm for doing this in a moment, but first let's look at the three main forms a filespec can take on:

- filename only;
- path and filename;
- path only.

There are a number of variations and special cases within these three broad forms. A filename may or may not have wildcard characters. A path may or may not include a drive specification, and may or may not terminate with a backslash. If a path terminates with a backslash, the backslash must be removed before issuing the Change Directory command. (COMMAND.COM performs this task for you when you issue the Change Directory command from the DOS prompt.) To complicate things further, when a path is the root, the "\" is treated as the directory itself rather than as an extra trailing backslash, or as a delimiter between the path and filename.

You might think that separating the path from the filename is a simple matter of looking for the drive delimiter (colon) or path delimiter (backslash). That works in many cases, but what about the filespec

```
C:\PCMAG\ASM
```

Is ASM a filename or directory? You can't tell since there's no second "\". DOS, however, will indirectly tell you if you try to make C:\PCMAG\ASM the current directory via function 3Bh (Change the Current Directory). If the call is successful then ASM must be a subdirectory and the filespec implies C:\PCMAG\ASM*.*. In the same inquiry motion you will have made C:\PCMAG\ASM the default directory. If the call fails, you can assume ASM is either a filename or doesn't exist and C:\PCMAG should be made the default directory.

Figure 1 shows the algorithm used by SHRED to parse the filespec and change the default directory (if needed). Before invoking the algorithm, the filespec is scanned for a drive specifier and, if found, SHRED logs onto that drive.

Basically, the algorithm looks for filespec forms that include a path, and then makes the path the default directory. When the filespec includes both a path and filename, the two parts are separated by temporarily replacing the character after the path with a zero. This works because the DOS Change Directory function expects the path string to be terminated by an ASCIIZ (null byte). When the filespec is a filename without a path, all the tests in the algorithm will fail and the default directory remains unchanged.

The code SHRED uses to implement this algorithm can be found in the assembly listing starting at the label CK_ROOT. After this code executes, the current directory is the directory where the file is located. This lets us open the file by passing just the filename; we don't have to construct a fully specified name that includes the path. If you use this algorithm, follow good programming practice and restore the default directory back to what it was originally before your program terminates.

SHREDDING FILES ON-DISK The shredding of files is actually quite easy with the help of a few DOS INT 21h function calls. Along with filename, the Find First and Find Next function calls return all the information about the file found in the disk directory. Of particular interest to SHRED is the size of the file. To obliterate the file, SHRED opens the file (function 3Dh) in write mode, writes (function 40h) zeros over all the clusters used by the file, closes the file (function 3Eh), and finally deletes it from the directory (function 41h). The DOS function calls do all the grunt work.

Shredding all of the free space of a disk is equally easy. First the available disk space is calculated. DOS function 36h returns the available clusters of a drive, the sectors per cluster, and the bytes per sector. Multiplying these three values together gives the number of available bytes on the disk. SHRED proceeds by creating a temporary file called SHRED.TMP and

writing zeros over the calculated number of bytes. You never actually see this temporary file, which consumes the rest of the disk, because the file is closed and deleted as soon as the writing is done. SHRED considers the coincidence that you already have a file called SHRED.TMP. If SHRED.TMP exists, a nonexisting file is found by running through the alphabet searching for a filename matching ?HRED.TMP. That's all there is to shredding. Well, almost.

EXTRA SPACE IN A CLUSTER A file's size—which is stored in the disk directory and returned by the Find First/Next function calls—may be less than the actual space allocated to the file. The reason has to do with how data is stored on the disk. As you probably know, disks are organized into units called *sectors*. Each sector in a normal DOS-formatted disk is 512 bytes in size. Sets of sectors—usually from 2 to 8—constitute a cluster. The number of sectors per cluster depends upon how the disk was formatted. Space is allocated for files in units of clusters.

For a disk formatted with a cluster size of two sectors per cluster, the smallest file unit is 1K (1,024 bytes) of disk space. All files of size between 1 and 1,024 bytes are allocated 1,024 bytes of disk space—one cluster. A file of 1,025 bytes jumps to two clusters of disk space or 2,048 bytes. (This difference is why the bytes used by files reported by the DIR command don't add up to the stats returned from CHKDSK. The file size returned by DIR is the length of the file and does not include the unused portion of the last cluster allocated by that file.)

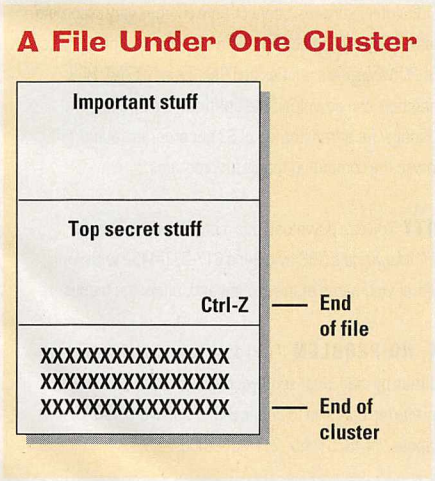


Figure 2: **This diagram represents the disk image after saving a top secret file slightly less than one cluster in size. The x's indicate any data already at the end of the cluster on the disk.**

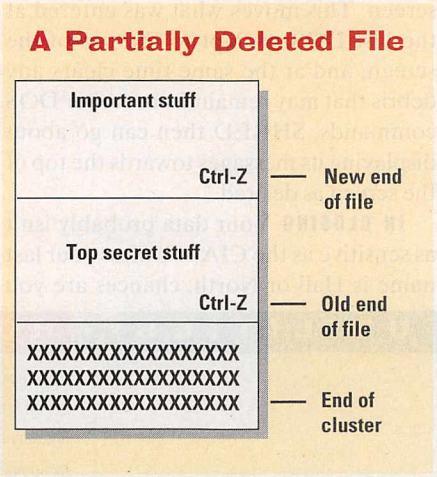


Figure 3: **When the top secret data is edited out of the file and resaved to disk, the file directory's size entry becomes smaller, but the top secret data is not destroyed.**

Let's see what that means to SHRED. Assume the same cluster size of two sectors of 512 bytes each described above. What happens when we create a data file that is about 1,000 bytes in size? At 1,000 bytes, the file needs less than one cluster of disk space, but since the smallest file unit is a cluster, the file is allocated 1,024 bytes. When the file is written to disk, the 24-byte balance of the disk cluster is untouched.

Let's further assume this file has a high profile with important data at the beginning and top secret data at the end (see Figure 2). You have to remove the top secret data from the file, so you load the file into your word processor, block delete the top secret data at the end of the file, and save the file back to disk. You sigh with relief that your computer no longer has that top secret data on disk. Or does it?

When you write the edited file sans top secret data back to disk, the secret data on the disk is not erased. The disk directory is updated to reflect the now-smaller file size. A ^Z character, the end of file marker, may be appended to the new end of the file. From all appearances the top secret data is gone. A DIR of the file says the file is smaller, and when you read the file back into your word processor the top secret data doesn't appear. The top secret data may still exist, however, towards the end of the last cluster allocated by the file (see Figure 3).

Now let's say you reach for SHRED to destroy the rest of the file. If SHRED used the file size to determine how many zeros to write, all that would be wiped out is the data currently in the file. SHRED needs to do better than that. The solution is simple: Take the file size, round it up to the nearest cluster size, and write that many zeros. This wipes out the entire last cluster allocated by the file, so that not only is the important data shredded, but also the elusive top secret data.

There is one area on your hard disk where secret data can hide from SHRED: the unused space at the end of a cluster for a file that is *not* deleted. Using the example above, if you delete the top secret data and then do not delete the file, the top secret data cannot be destroyed by SHRED. This capability, which is provided by Norton's WipeInfo utility, involves using the directory entry to find the end of the file, and then performing direct sector writes to fill the end of the cluster with zeros.

You can manually wipe the unused space at the end of a cluster for a file you do not want to delete by a simple trick. Append a nonsensitive file to your document that is at least as large as your cluster size, save the file, then delete the extra information and save the file again. The end of the cluster will contain the non-sensitive file that you previously appended.

DOS PROMPT PRESERVED The first thing SHRED does when it is run is to display the standard announcement of copyright notice and program syntax description. Without special steps, if SHRED happened to start with the DOS prompt at the bottom of the screen, the messages would scroll up from the bottom onto the screen. I may be picky but I find the blur of scrolling disturbing. It's much cleaner to have SHRED place its messages at the top of the screen from the outset, without the scrolling. The simplest solution to this rather subtle annoyance is to first clear the screen and then start displaying messages from the top. BIOS INT 10, function 0, Set Video Mode accomplishes this. Besides clearing the screen, setting the mode also homes the cursor to the top left of the screen.

Clearing the screen, however, also clears the DOS command line that initiated SHRED. Often users want to compare what the program is doing to what they

entered at the command line. It's desirable for the last DOS command line to remain on screen. SHRED accomplishes this by using the BIOS Scroll Active Page, function 6, instead of using Set Video Mode. Since the cursor is always on the next line below the last DOS prompt when a program begins, SHRED asks the BIOS to scroll the screen from the row right above the cursor to the top of the screen. This moves what was entered at the last DOS prompt to the top of the screen, and at the same time clears any debris that may remain from earlier DOS commands. SHRED then can go about displaying its messages towards the top of the screen as desired.

IN CLOSING Your data probably isn't as sensitive as the CIA's. Unless your last name is Hall or North, chances are you don't have much need to shred data. Maybe the closest you get to sensitive data is a personal e-mail missive now and then that you don't want others to see. Whatever it is, if there is something you no longer need and you don't want anyone to see it, shred it and feel secure. □

MICHAEL J. MEFFORD IS A CONTRIBUTING EDITOR OF *PC MAGAZINE*.

GUIDE TO OUR UTILITIES & HOW TO GET THEM

SHRED

PURPOSE: 2 SHRED destroys sensitive or secret files on-disk so they can't be recovered by any means.

When it is deleted, a file normally is not physically destroyed, only its directory entry is removed. Nor does reformatting a disk destroy the files, either. SHRED however makes sure files are obliterated by overwriting the files you specify with zeros.

SYNTAX: `SHRED [d:] [filespec] [/S] [/F] [/D] [/C]`

The d: parameter is the target disk drive, and "filespec" is the target path and filename. If no path is specified, the current directory is assumed.

/S tells SHRED to delete all the files in the current directory and all files in all subdirectories beneath it.

/F tells SHRED to delete all the free space on the disk—that is, to shred all the files you've deleted in the past.

/D tells SHRED to delete only (like the DOS DEL command); no shredding.

/C tells SHRED not to ask for confirmation before shredding. *Use this option with caution!*

REMARKS: All the SHRED options can be used in combination except for /D and /F. If you use these two options together, the /F is ignored.

The /D option in combination with the /S option will delete (but not shred) all the files in the current subdirectory and all the files in all the subdirectories beneath it. Unlike the DELTREE command found in DOS 6.0 or later, a SHRED /D command will not affect read-only files or the directory structure itself.

Once you have shredded a file, it is gone forever! If there is any chance that you might need the file in the future, do not shred it. No unerase utility will work once SHRED has destroyed a file.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

■ HARDWARE

Last Word on Envelopes

TIP Here's a simple way to stop your laser printer from sealing envelopes. Save the waxy backing sheets left over from self-stick labels. Before you print an envelope, put one of the sheets under its flap. Afterwards, simply peel the flap away from the backing, then store the sheet by the printer and you'll be ready for the next envelope-printing job.

Jess Schilling
Huntingdon, Pennsylvania

▶**PC MAGAZINE:** I promised myself I wouldn't print another letter on this topic; then, along came this excellent tip. But this is the last word on the subject. I promise.

If you intend to try this on your printer, keep a few points in mind. First, backing sheets are often slippery on only one side. Make sure the slippery side faces the envelope's gummed flap. Also, before using the backing sheet, strip off any unused labels—one or more pieces of sticky label paper running through your printer could wreak havoc on it.

If you print lots of envelopes, you might want to cut the backing paper into envelope-size sheets, which you could preinsert into a stack of envelopes. You'll save yourself the inevitable hunt for backing sheets and prevent humidity from sealing the envelopes while they sit in a drawer.—*Alfred Poor*

Wiggly Picture

? The image on my 14-inch color VGA monitor shakes at a steady rate no matter what application or video setting I use. I've been told that the problem is caused by a magnetic field in the area, but I haven't been able to locate the source or to shield the monitor. I tried using a different monitor, but it showed the same screen wiggle. Is there any hope of solving this problem?

Alan Behler
Boynton Beach, Florida

▶**PC MAGAZINE:** The source of the problem may be closer than you think, perhaps right under the monitor. I suspect that the problem is your computer, which may not be shielded sufficiently.

There is a simple way to test this theory. Move your monitor as far from the PC as the cables will permit. If the screen wiggle is reduced or eliminated, your machine is more than likely the source of the problem. To test further, borrow a notebook computer with a VGA port, and run your monitor with the notebook; let the monitor sit on the desktop computer case. Then turn the desktop computer on and off and see whether the monitor wiggle comes and goes with the PC's power.

If the PC is the source of the interference, you may be able to eliminate it by buying a new case and moving the motherboard and other components to the new case. If the PC is not the source, and you can't find a way to shield the workspace, you might want to consider an LCD panel instead. While LCD panels are expensive compared with cathode-ray tube monitors, they are far less susceptible to magnetic or radio-frequency interference and should give you a more stable image.
—*Alfred Poor*

■ OPERATING ENVIRONMENTS

Changing Your User Name In Windows Revisited

TIP Regarding the item about changing your user name in Microsoft Windows in the Solutions column of March 29, 1994, try this method instead,which doesn't require you to find any disks.

In the Program Manager's File | Run dialog box, run the command `SETUP /F`. Windows Setup will start. Enter the desired name and company name. Setup will then ask you what components of Windows you'd like to install. As in the earlier solution, check the box labeled "Set Up Only Windows Components You Select" and deselect the other two boxes. On the next screen, deselect all of the components and continue. Setup will then look for a floppy disk on your A: drive. Of

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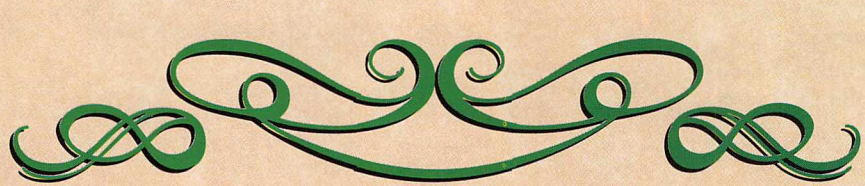
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See index, page 266.



Only MidWest Micro Could Alter Scrooge's Fate...





The Ghost of Computers Present—and Future

While Scrooge waited patiently for instructions from the ghost, he grew more and more curious about the strange clutter in their midst. What could be the meaning of these mouth-watering foods mixed with mysterious computer products – the likes of which the old man had never seen?! Finally his answer came...



"I was sent to deliver the Present and *Future* of computer technology," the ghost bellowed. "These Intel-based Elite Systems which surround us have captured the extraordinary powers of PCI and Pentium™. It is now up to *you*, Ebenezer, to release them."

The spirit's thundering voice sent chills up Scrooge's brittle spine.

"Please, wise spirit, have mercy upon me. Tell me more about these 'Elites,' and what I, a mere mortal, must do to help your cause."

"Many of these fine Elite Systems contain a powerful Intel® Pentium Processor," explained the ghost, "capable of 60, 66, 75, 90 or 100 MHz speeds."

Scrooge never dreamed *anything* could move so quickly.

"While others," he continued, "rely on formidable 486 processors and advanced PCI Local Bus architecture for their impressive performance.

The spirit now turned to the system closest to him, a P5-90 Home PC – and with a single touch, brought its 15" monitor to life.

"Fear not, Scrooge," said the ghost. "Touch the key of your choice, and we shall begin."

Scrooge's trembling index finger came to rest on the symbol that was the dollar sign – in an instant the screen erupted into a multimedia frenzy. Without leaving the room, he saw himself walking about the streets of London – peering into the lives of those less fortunate. He could almost feel the cold air biting his bare feet...smell the aroma of a Christmas goose cooking. He even heard a choir of small children singing.

"Where do these angelic voices come from, spirit?" he asked.

"Altec Lansing Stereo Speakers," said the ghost.

The spirit then explained that it was the combination of a Pentium Processor, superscalar architecture and advanced PCI Local Bus technology that allowed this Elite to access peripherals with such haste.

When the adventure was over the ghost turned off the system and looked down earnestly upon Scrooge.

"These people you have just witnessed, hunger desperately for power. Without an Intel-based Elite System in their lives, I shudder to think what may become of them. You must tell them of Pentium and PCI – of MidWest Micro's affordable PCI, Home PC and Pentium Processor Based Systems!"

"You have my word," promised Scrooge.

"And you, Scrooge, do you hunger as well?"

"Yes, spirit. I too could benefit from the power of an Elite."

"No," said the ghost, "I *mean* are you *hungry*? I fear I cannot eat all this food without help."

And since Scrooge did not expect another spirit until the bells tolled one, he seated himself with the ghost among the awe-inspiring Elites – and thus began to feast.



AD#G01

90 MHz Pentium™
Loud and Strong Enough to Break the Chains



Trembling at the sight of Jacob Marley's ghost, Ebenezer Scrooge still managed to utter one more "Bah Humbug!" Perhaps it was just a bad chestnut or bite of plum pudding causing him to hallucinate. As he was pondering this, the vision spoke...

"Poor old Ebenezer," his dead partner moaned. "This is neither a dream nor indigestion. I have come to warn you before it's too late – you see, these chains I bear are those I forged in life. And unless you change your way of computing, this will be your fate as well. Like you, I believed a faster, more versatile machine was the key to prosperity. Unfortunately, this obsession with power kept me chained to my office – day in and day out. In my search for the perfect computer, I encountered only a few desktop systems swift enough to suit me – but alas, they were dreadfully heavy. And the portables? Why, I fear my horse-drawn carriage could run faster."

Scrooge nodded in agreement, for he recognized Marley's plight.

"Tell me, Jacob, whatever can I do?" he asked.

"Hold onto your nightcap, Ebenezer – for you will scarcely believe what you are about to witness."

Scrooge looked closely at the object floating above Marley's wrinkled hands.

"Why, it's just another notebook," he said.

"No," shrieked Marley, "this is the Elite SoundBook Plus based on Intel's Pentium™ Processor. It's like no other notebook you've ever seen...or heard!"

"And it dares to challenge my full-size computer?" asked Scrooge in amazement.

"Did my words escape you, old man?! The Elite SoundBook Plus has captured the power of *Pentium*! Couple that with its remarkable PCI Local Bus architecture, high-speed synchronous cache and 16-bit stereo sound – and this 90 MHz notebook more than '*challenges*' your cumbersome computer... it clearly outperforms it!"

"But a portable Pentium?!" gasped Scrooge. "A talking 90 MHz notebook?! It's pure humbug I tell you."

Yet Ebenezer prayed this spirit spoke the truth. For an invention such as this would surely double his productivity – and thus free him from his dark and gloomy office. Marley then summoned the Elite 486 SoundBook with business audio features and an assortment of delightful screens, rapid processors and generous hard drives to choose from.

"Oh thank you, Jacob," cried Scrooge. "Thank you for delivering these remarkable notebooks from heaven's gates to my humble chambers."

"Heaven, indeed!" laughed the ghost. "Elite SoundBooks are found right here on earth – but only at MidWest Micro."

"Then what about the price?" asked Scrooge. "Notebooks such as these surely cost a full year's wages!"

"Wrong again," said Marley. "MidWest Micro knows you don't want to *pay* extra pounds any more than you wish to *carry* them. That's why they offer these lightweight Elites at prices even *your* employees can afford."

And without another word, the late Jacob Marley was gone...leaving only a puff of smoke and MidWest Micro's toll-free number behind.



intel inside pentium PROCESSOR

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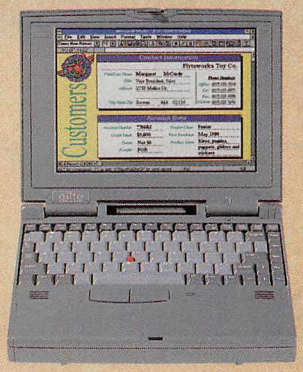
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course, this will fail since there won't be a disk in the drive. Just click Exit Setup, and you're done!

Gordon Jennings
Sharon, Ontario, Canada

▶PC MAGAZINE: Here's a convenient way to correct your user- and company-name information if you or someone else made a mistake during the original Windows installation. Be warned: Though this technique is indeed simpler, certain precautions are necessary. Before you run `SETUP /F`, close all applications except Program Manager. Why? Because when you select Exit Setup and confirm your action, you'll be dumped unceremoniously back to DOS! Despite the surprise ending, I prefer this technique simply because it doesn't force you to dig out your original Windows disks.

—Neil J. Rubenking

Why You Should Partition Your Hard Disk

? My hard disk is formatted with two partitions, C: and D:. I keep my database management program, my word processing program, and my spreadsheet program on the C: drive, and I keep the data files for all three programs on my D: drive.

Am I really getting some benefit from this division? It's certainly easier to back up only the data-file drive, but am I forfeiting speed or anything else by working between two drives? When I move up to my next computer, would I be just as well off to put everything on one partition (with appropriate subdirectories, of course)?

Raymond Epstein
Chicago, Illinois

▶PC MAGAZINE: This question comes up frequently on PC MagNet. The short answer is, The bigger your partition, the bigger the percentage of disk space wasted. If you get a new computer with a bigger hard disk, you'll still want to consider dividing it into partitions under 128MB. Here's why.

The smallest unit of disk data is the 512-byte sector, but when it comes to parceling out disk space to files, DOS uses groups of sectors called *clusters*. The number of sectors in a cluster is always a power of two, and the number of clusters in a partition can't exceed 64K. The last cluster of each file will contain anywhere from 1 byte to a full cluster of data, so on the average half a cluster per file is wasted. Partitions from 16MB to just under 128MB have 2K clusters, so on these, a 1-byte file will still occupy 2K of disk space. For partitions from 128MB to just under 256MB, clusters are 4K in size. Every file occupies at least 4K of disk space, and there's an average of 2K wasted for every file on the disk.

Worse yet, the percentage of disk space wasted increases with bigger partitions. Assume for the sake of argument that an almost-128MB partition has 1,024 files and that a partition twice as big will have twice as many files. An average of 1K wasted for each of 1,024 files means a total of 1MB wasted, or $^1/_{128}$ of the partition. Now double the partition size to just under 256M. An average of 2K wasted for each of 2,048 files means a total of 4MB wasted, or $^1/_{64}$ of the partition. As the partition size doubles, both the number of files and the amount of waste per file double, so the percentage of the partition that's wasted doubles as well. On this

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basis, an almost-512MB partition will be 1/32 wasted, and an almost-1G partition will be 1/16 wasted!

This whole argument goes out the window if you use disk compression, however. The storage method used by Stacker 3.*x* (and by the ill-fated Microsoft DoubleSpace) can pack portions of multiple files into a single cluster, thus avoiding waste. The storage method used by Stacker 4.0 goes even further and packs portions of multiple files into individual sectors!—*Neil J. Rubenking*

Controlling DOS's Screen Color

❓This may be a bit trivial, but I'm tired of my dark DOS screen. I know there must be a way to give it a background color, since I've used The Norton Utilities to change monitor colors, but I don't know how to do it without Norton. Do I add something to my AUTOEXEC.BAT file?

Paul K. Christianson
via ZiffNet

▶**PC MAGAZINE:** Setting the background color for DOS commands is not such a complicated process, as long as you have DOS's ANSI.SYS device driver loaded. To see whether ANSI.SYS is loaded, enter the following command:

```
PROMPT $e[37;40m$p$g
```

If you see numbers in the DOS prompt after this command executes, ANSI.SYS is not loaded. Look for the file; it should be located either in the root directory of your boot drive or in your DOS directory. Then use your favorite text editor to add the line `DEVICE=C:\DOS\ANSI.SYS` to your CONFIG.SYS file. (Naturally if ANSI.SYS is located in a directory other than C:\DOS, you'll specify that directory.) Reboot your system so that the modified CONFIG.SYS can take effect.

Now you can use the PROMPT command to set your choice of foreground

```
@ECHO OFF
IF '%2'=='' GOTO Help
IF '%3'=='' GOTO NoBright
PROMPT $e[0;3%1;4%2;1m$p$g
GOTO Show
:NoBright
PROMPT $e[0;3%1;4%2m$p$g
:Show
ECHO ON
ECHO OFF
CLS
ECHO Prompt for this color combination is:
ECHO PROMPT %PROMPT%
GOTO End
:Help
ECHO SYNTAX: TRYCOLOR F B [Bright]
ECHO   F and B are numbers from 0 to 7 representing
ECHO     Foreground and Background colors
ECHO   If a third parameter is present, the Foreground
ECHO     will be bright.
ECHO EXAMPLE: TRYCOLOR 3 4 B
ECHO   Yields bright yellow text on blue background
ECHO EXAMPLE: TRYCOLOR 7 0
ECHO   Yields dim white text on black background
:End
```

Figure 1: **TRYCOL.BAT lets you change DOS's colors and then reports the PROMPT command it used to do so.**

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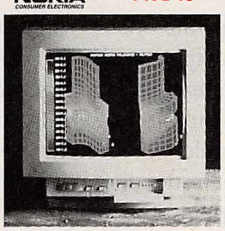
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and background colors for DOS commands. The batch file TRYCOL.BAT (Figure 1) will help you make those choices. (You'll find it in PC MagNet's Utilities/Tips Forum in the User-to-User section.) You pass the batch file a number from 0 to 7 for the foreground color and another number from 0 to 7 for the background. If you add a third parameter, the foreground color will be bright. TRYCOL.BAT clears the screen with the new color combination and displays the PROMPT command line that produced it. When you find a combination you like, note the PROMPT command displayed and add it to your AUTOEXEC.BAT file.

Do note that only DOS commands and other very simple programs will be affected by the ANSI screen colors. Most modern applications take complete control of the screen and use their own colors.
—Neil J. Rubenking

Changing Windows System Fonts

Some time ago you presented a tip that concerned changing the font Windows uses in its menus, window titles, and so forth. I know it had something to do with inserting a line that looked something like `FONT=fontname` in your WIN.INI file, but I just can't remember exactly what to do. Can you help?

Mark Shafer
via Internet

▶PC MAGAZINE: To change the system font, open WIN.INI and find the [Windows] section. Find or create a line that begins `SystemFont=`, and finish that line with the filename of any raster font that has the extension .FON and is found in the windows\system directory. For example, `SystemFont=SERIFE.FON` will give you menu items and window titles in Times Roman. If you're not sure which fonts are raster fonts, find the [Fonts] section in WIN.INI and look for ones that include the string "(VGA Res)".

That takes care of the window titles and menus, but you'll probably want to change the icon title font as well (Figure 2). As you'd expect, the [Desktop] section of WIN.INI is the home turf for lines that control the appearance of icon titles on the desktop. To select a font, set IconTitleFaceName to the exact name of the typeface you want, set IconTitleSize to the desired point size, and set IconTitleStyle to 1 for bold or 0 for normal; for example:

```
IconTitleFaceName=Times New Roman
IconTitleSize=12
IconTitleStyle=1
```

Note that if the font you choose is not a TrueType font, Windows may not deliver the precise point size you requested. The first two of these WIN.INI keys are described in Microsoft's Windows Resource Kit; the third appears to be documented only in Microsoft's on-line Knowledge Base.*—Neil J. Rubenking*

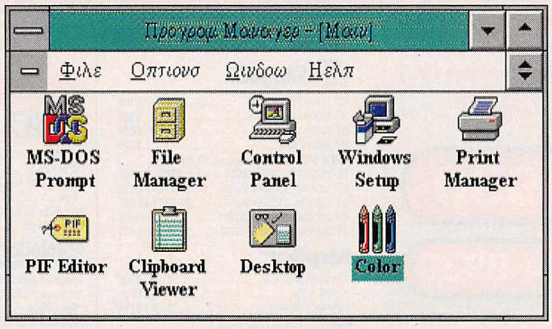


Figure 2: **By changing WIN.INI, we set the icon font to bold 12-point Times New Roman and the menu and window title font to Symbol.**

WORD PROCESSING

Toggling Between Tiled and Full-Screen Modes in WordPerfect

TIP The Solutions column of February 23, 1993, included a useful WordPerfect 5.1 macro for switching between split- and full-screen views of two documents. The equivalent macro for WordPerfect 6.0 for DOS can be even more useful, since WordPerfect 6.0 lets you open up to nine documents.

Unfortunately, WordPerfect's conversion program, MCV.EXE, doesn't convert the 5.1 macro completely. Instead, it partially converts the macro, then offers the warning that the 6.0 Window tokens are not fully 5.1-compatible. Figure 3 shows a rewritten, working version of the macro.

J. Wallingford
Luberton, North Carolina

▶PC MAGAZINE: Like the original WordPerfect 5.1 version, this 6.0 macro for toggling between full-screen and tiled document windows is straightforward. Note the `Persistall` command in the first line, which tells WordPerfect that all variables in the macro—WinSplit in this particular macro—should persist throughout the current session. If you leave the `Persistall` command out, the WinSplit variable will quietly disappear every time the macro finishes. Then the next time you run the macro, the `IF(Exists(WinSplit))` command will find that the variable doesn't exist, and the macro will always set WordPerfect to a tiled screen.

Note too that the macro operates through blind navigation. Rather than checking on the actual state of the screen, it keeps track of the screen setting with the WinSplit variable. If you change to or from a full-screen document window manually at any point, the macro will be

```
Persistall
//Check if macro has been executed in this session
IF(Exists(WinSplit))
ELSE Assign(WinSplit; "Full")
EndIf
//If full, set to tiled.  If Tiled, set to full
If(WinSplit="Full")
     WindowTile
     Assign(WinSplit; "Tiled")
Else
//For the Windows version, the next line should be DocMaximize
     WindowMaximize
     Assign(WinSplit; "Full")
EndIf
```

Figure 3: **This macro toggles WordPerfect 6.*x* between full-screen mode and a tiled screen for all open documents.**



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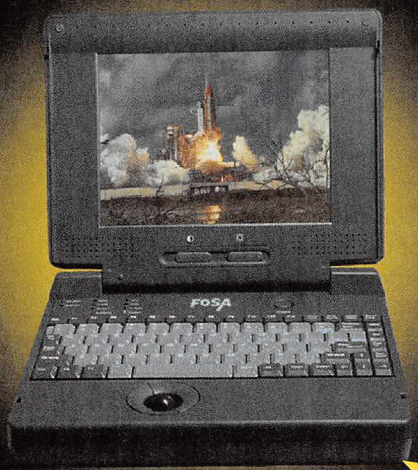
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out of sync with the program, and you'll have to run the macro twice to see any effect. A more elegant technique would be to have WordPerfect check the state of the window and act accordingly. Unfortunately, the macro language doesn't offer that feature.

You only need to modify the macro a bit to use it in WordPerfect for Windows. Just change the third from last line to `DocMaximize` for the Windows version, as opposed to `WindowMaximize` for the DOS version. (Both versions are available for downloading from the Utilities/Tips Forum on PC MagNet, archived as TILE.ZIP.)

Be aware that the Windows version of this macro is not completely reliable in WordPerfect for Windows 6.0. In testing the macro, I sometimes got the message that the macro was canceled due to an error condition. After maximizing a document or choosing Window Tile manually, however, the macro worked again. This problem appears to be a bug, and seems to be fixed in Version 6.0a.

— M. David Stone

SPREADSHEETS

Excel Charts with Two Y-Axes

TIP In Microsoft Excel 5.0 you can't ordinarily create a chart in which one series is plotted in columns against the primary *y*-axis and a second series is plotted in columns against a secondary *y*-axis. To see the problem, try creating a column graph from the data in Figure 4. Put the Debt column on the primary *y*-axis and Per Capita Debt on a secondary *y*-axis.

Year	Debt	Per Capita Debt
1900	1,200,000	17
1910	1,100,000	12
1920	24,200,000	228
1930	16,100,000	131
1940	43,000,000	325
1945	258,700,000	1,849
1950	256,100,000	1,688
1955	272,800,000	1,651
1960	284,100,000	1,572
1965	313,800,000	1,613
1970	370,100,000	1,814
1975	533,200,000	2,475
1980	907,700,000	3,985
1985	1,823,100,000	7,598
1990	3,233,300,000	13,000

Figure 4: **Try plotting this data with the Debt column on the primary *y*-axis and Per Capita Debt on a secondary *y*-axis.**

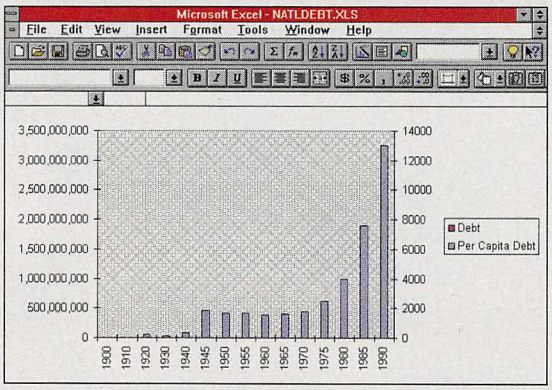


Figure 5: **This chart was created from the data in Figure 4. Notice how you can't see the second series behind the first.**

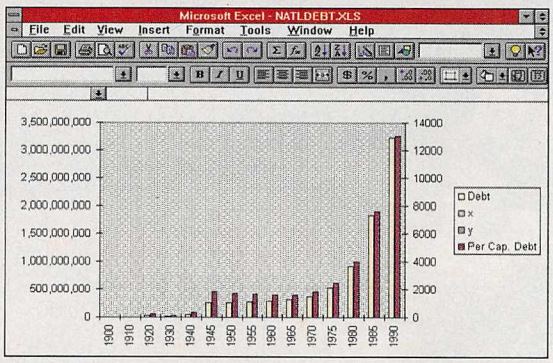


Figure 7: **Adding the dummy rows in Figure 7 fixes the problem in Figure 5.**

As you can see in Figure 5, the Per Capita Debt series seems to disappear when you convert it from a line to a column. If you press the Up Arrow key to cycle through all the chart elements, you find that both series are still there, but Excel has superimposed the two series, making series 2 invisible.

Here's the workaround: Start by adding two dummy columns to your data set, as in Figure 6.

Then follow these steps:

- Select the data range, and choose Insert | Chart | As New Sheet.
- Click Next to go to the second step of the Chart Wizard.
- Select the Combination chart type, and click Next.
- Select chart format number 2 (3 would work also), and click Next.
- Click Finish.
- Select the line series, choose Format | Line Group, and then click the Chart Type button. Make sure Line Group is selected under Apply to. Click the Column chart type, and click OK.

The result is shown in Figure 7. You'll probably want to get rid of the legend, since it unavoidably includes the two dummy series.

Shane Devenshire
Walnut Creek, California

▶PC MAGAZINE: A spokesperson for Microsoft confirmed that Excel 5.0 is unable to plot two series as columns against separated in columns against a secondary *y*-axis.

Year	Debt	x	y	Per Cap. Debt
1900	1,200,000	0	0	17
1910	1,100,000	0	0	12
920	24,200,000	0	0	228
1930	16,100,000	0	0	131
1940	43,000,000	0	0	325
1945	258,700,000	0	0	1,849
1950	256,100,000	0	0	1,688
1955	272,800,000	0	0	1,651
1960	284,100,000	0	0	1,572
1965	313,800,000	0	0	1,613
1970	370,100,000	0	0	1,814
1975	533,200,000	0	0	2,475
1980	907,700,000	0	0	3,985
1985	1,823,100,000	0	0	7,598
1990	3,233,300,000	0	0	13,000

Figure 6: **Adding two dummy columns to the data you're plotting fixes the problem of one series's chart columns hiding those of the second series.**

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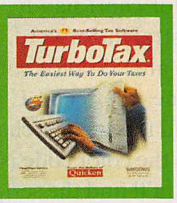
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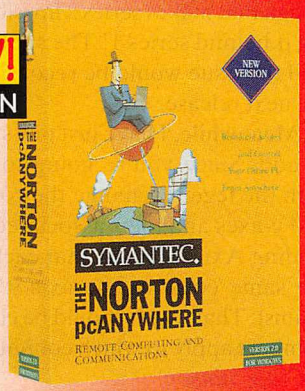
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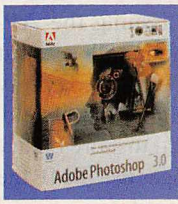
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arate *y*-axes and said that this behavior was "by design." It's hard to cheer for a design that makes series 2 invisible by hiding it behind series 1! The spokesperson said the issue would be reconsidered for the next release.

Meanwhile, I have just one suggestion to add. Since you're going to do away with the legend, change the color of the two *y*-axes and their associated text (including Axis titles) so that each series is the same color as the axis it's plotted against. That way it should be clear which numbers apply to which columns.
—*Craig Stinson*

```
;-------------------------------------------------------------------
; COLORS.SC                                          Paradox for DOS
;-------------------------------------------------------------------
@ 0,0 CLEAR EOS                 ; Clears the screen
CNTR = 0                        ; Sets ATTRIBUTE counter
MROW = 0                        ; Sets ROW position
MCOL = 0                        ; Sets COLUMN position
WHILE CNTR < 256                ; Loops for maximum number of color combinations
  STYLE ATTRIBUTE CNTR          ; Sets color combination
  @ MROW,MCOL ?? format("W5,AC",CNTR)  ; Displays color combination
  CNTR = CNTR + 1               ; Increments COLORS
  MCOL = MCOL + 5               ; Increments column position
  IF MCOL > 79 THEN             ; Starts new line
    MCOL = 0
    MROW = MROW + 1             ; Increment row
  ENDIF
ENDWHILE
MESSAGE "Press any key..."
X=GETCHAR()
```

***Figure 8*: Having trouble remembering your Paradox color codes? This script displays a helpful color chart.**

DATABASES

Remembering Paradox Color Codes

TIP If you are a Paradox 4.5 for DOS user who uses the built-in PAL script editor, you face an obstacle when writing scripts if you need to include different screen-attribute colors in your code. Currently, there is no way to display the available color attributes. Of the 255 color combinations available, you'd be hard pressed to remember that 63 is RED ON WHITE or that 203 is FLASHING CYAN ON RED.

Depopulating a general field programmatically is anything but obvious.

The script in Figure 8 lets you press a hotkey to display a color chart from anywhere within Paradox, including the PAL editor. The chart displays each attribute number in its proper color combination.

To use the script, insert a line in your INIT.SC that says

```
SETKEY -46 "C:\\PDOX45\\COLORS.SC"
```

This will set Alt-C as your hotkey, which, when pressed, will run the script.

Mark J. Gorrie
Nazareth, Pennsylvania

▶PC MAGAZINE: Remembering the Paradox color codes is certainly made easier by having a pop-up color chart handy. The code in Figure 8 is straightforward. The script loops through all 255 color combinations. For each one, the STYLE ATTRIBUTE command is issued to change the screen color, and the color code is displayed on-screen. You'll find the script in PC MagNet's Utilities/Tips Forum as COLORS.ZIP.—*Sal Ricciardi*

Clearing a FoxPro General Field

TIP A recent project required that I import PICT files into a general field in a Microsoft FoxPro for Windows table. I needed to empty the general field for a large number of records so I could import modified PICT files. I know that importing the files would have overwritten the existing contents of each general field, but I wanted to empty the fields first so that I could make sure the new PICT files were indeed imported.

First I tried the command

```
REPLACE <general> WITH ""
```

but I got a "Data type mismatch" error. Then I tried replacing the field with an empty general field in a second table, but that resulted in an "Illegal operation for General field" error.

Finally, I tried the

```
APPEND GENERAL <general> FROM <file>
```

command with an empty file, but I accidentally hit the RETURN key before I entered "FROM <file>", making the actual command

```
APPEND GENERAL <general>
```

I expected FoxPro to complain, because the documentation and on-line help show "FROM <file>" as a required clause. But lo and behold, the general field was cleared!

This tip will be valuable to others who need a programmatic way to clear the general field of a large number of records.

Michael Rothaus
Conshohocken, Pennsylvania

▶PC MAGAZINE: This technique seems to be undocumented, but issuing the APPEND GENERAL command without specifying a filename does indeed empty the contents of the specified general field.

General fields are used to store binary data such as graphics images in a .BMP file or an OLE object. To populate a general field programmatically, you use the APPEND GENERAL command. This has never made sense to me. Why not use the REPLACE command? That would seem more consistent. But depopulating a general field programmatically is anything but obvious. Note that you can use an

```
APPEND GENERAL <general>
```

command within a SCAN-ENDSCAN loop to clear out an entire column of general fields.—*Sal Ricciardi*

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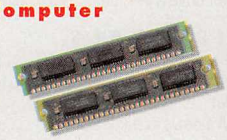
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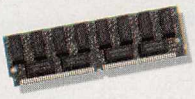
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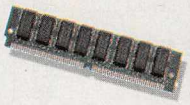
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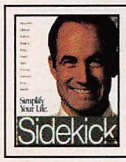
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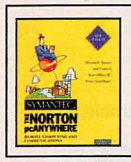
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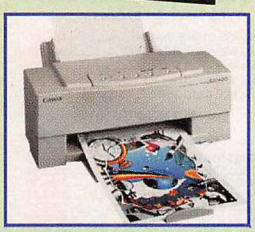
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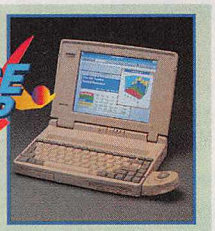
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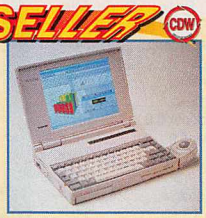
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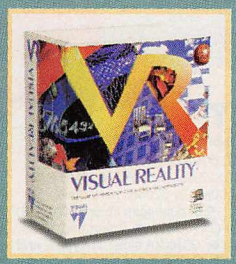
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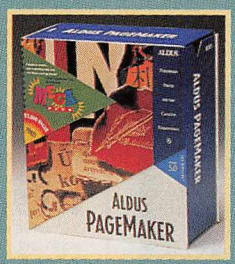
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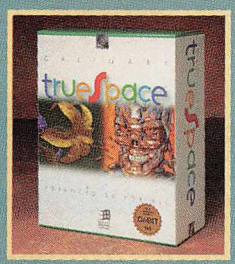
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Fast moving PCs that stay ahead of even the most serious workload, Genesis and Premier, two 486-powered PC product lines designed for value and performance. Both systems comply with EPA requirements for conservation and Energy Star designation, feature 128KB Level 2 Cache, and arrive ready to run with Windows 3.11, DOS 6.22, and Microsoft Works installed.

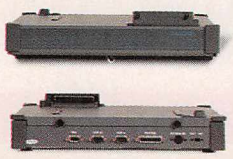
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NOTEBOOK AND DESKTOP UPGRADES.







NOTEBOOK UPGRADES

Prices good with notebook purchase only.

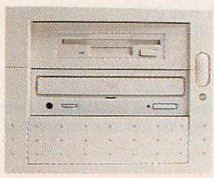
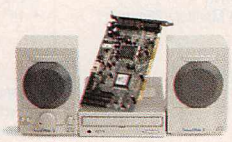
Docking Station
This desktop docking station transforms your Austin notebook into a full-fledged PC system, providing 1 ISA slot, VGA, keyboard and mouse ports.
Austin Docking Station $299

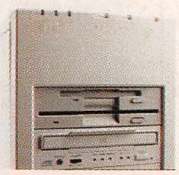
PCMCIA Audio Card
With this audio card installed, your notebook performs with a full sound system.
PCMCIA Audio Card $349

A Case for Protection
Maximizie your Austin notebook with this custom-designed carrying case. Room for cables, extra battery, the works.
Austin Leather Travel Case . . . $99
Austin Ballistic Nylon w/Leather Trim Travel Case. $129

Desktop Bundle
The complete desktop/ notebook package: 15-inch digital, non-interlaced monitor, notebook docking station, keyboard, mouse – an $814 value
Austin Desktop Bundle $699

Total Travel Package
Important accessories to maximize your road trips includes carrying case, battery, external charger, 14.4 fax/modem, and car adapter – an $585 value
Austin Notebook Travel Package $490


DESKTOP UPGRADES

Prices good with system purchase only.

The Drive for Multimedia
A CD-ROM drive is a key component of your multimedia upgrade. This unit means faster performance and easy installationn.
2X CD-ROM add. $149

A Sound Investment
Install a CD-ROM, 16-bit sound card, and stereo speakers. Your PC is ready to blast you out of your chair.
Multimedia upgrade Kit (CD-ROM drive, sound card, speakers) . $199

See More of What You Like
In multimedia, bigger is better, particularly when you're upgrading to a 17-inch, non-interlaced SVGA monitor.
14" to 17" Monitor. . . . . add $440
14" to 15" Monitor . . . . . add $90

The Floppiest Drive
Save an extra drive bay for CD-ROM by combining both 3.5-inch and 5.25-inch drives in one unit.
Dual floppy Drive $55

Add Your Voice
The Microsoft sound system includes a microphone, ISP-16 audio card, and the software to make the most of your voiceovers and file annotation.
PC Voice Kit $129

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- To order by fax, send to 1-800-454-1357
- For Corporate and Major Accounts, call 1-800-622-5506
- For government sales, call 1-800-833-4472

(Purchase orders accepted for qualifying accounts).

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- Use the Austin Direct credit card. Ask your Austin representative for more information about this useful financial tool.
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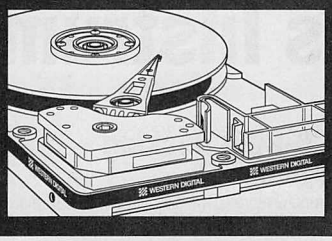
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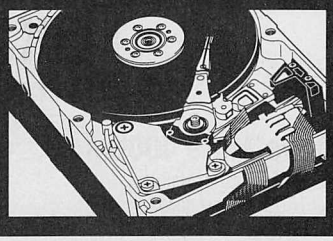
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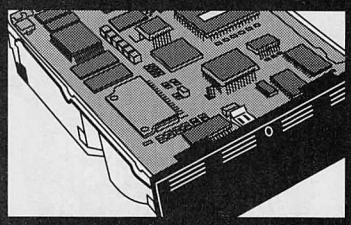
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The Drive Authority!







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Nobody knows drives like MegaHaus. We have specialized in storage solutions for over 8 years. Repeat business from satisfied customers is the backbone of our business. We satisfy our customers.

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During the first year of your warranty, we replace: not repair, any defective items. All items receive lifetime technical support from our factory trained techs.

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Our multi-million dollar inventory offers you the best diversity and availability in the market. We ship most orders the same day. Each order is checked at least four times for accuracy.

FAST, EASY INSTALLATION

Anyone can sell you a hard drive. We sell easy to install storage solutions. We spend countless hours researching the best solutions, then create our quick precise installation guides for each kit.

UNBEATABLE DEALS

WESTERN DIGITAL

#1 IDE drives. 3 year warranty, 64K cache.

420MB	12ms	WDAC2420	$197
540MB	12ms	WDAC2540	$233
730MB	10ms	WDAC2700	$289
1083MB	10ms	WDAC31000	$445

MICROPOLIS

Best buy large capacity drives! 5 year advanced replacement warranty.

1740MB	IDE or SCSI	10ms	MC2217	$799
2050MB	IDE or SCSI	8.5ms	MC4221	$1325
4294MB	SCSI	8ms	MC3243	$2189

Seagate

MegaHaus unbeatable price! WIDE SCSI in stock.

2139MB	8ms	7200rpm	ST12550N	$1199
2148MB	9ms	5400rpm	ST12400N	$1029
4290MB	8ms	7200rpm	ST15150N	$2239
9080MB	10ms	5400rpm	ST410800N	$3339

FUJITSU

JAPANESE QUALITY! INCREDIBLE PRICE!

240MB	2.5"	14ms	IDE or SCSI	1yr wty.	$279
530MB	3.5"	13.8ms	IDE	2yr wty.	$225
530MB	3.5"	13.8ms	SCSI	2yr wty.	$245
1080MB	3.5"	9.5ms	SCSI	5yr wty.	$525

NEW TAPE DRIVES!

Run on floppy controller. 1 FREE tape. Save $10 w/ drive sale.

Capacity	Brand	Warranty	Internal	External
250MB	IOMEGA	5yr	$155	$279
420MB	CONNER	2yr	$195	$339
850MB	CONNER	2yr	$289	$429

PIONEER

External CD ROM changers. No more disc swapping!

6 Disc	Double Speed	DRM602X	$439
6 Disc	Quad Speed	DRM604X	$989
18 Disc	Quad Speed	DRM1804X	$1899

HARD DRIVES

CONNER

IDE			
210MB	14ms	CFS210A	$166
420MB	14ms	CFS420A	$205
850MB	10ms	CNR850A	$419
1275MB	9ms	CNR1275A	$539

Maxtor

IDE			
135MB	12ms	M7135AV	$139
270MB	12ms	M7270AV	$162
420MB	12ms	M7420AV	$198
540MB	12ms	M7540AV	$245

MICROPOLIS

IDE			
1050MB	10ms	MC4110A	$539
1740MB	10ms	MC2217A	$879
SCSI			
1052MB	8.5ms	MC4110	$539
1740MB	10ms	MC2217	$799
2050MB	8.5ms	MC4221	$1325
3020MB	11ms	MC1936	$1659
4294MB	8ms	MC3243	$2189
9100MB	12ms	MC1991	$3459
SCSI-AV Audio / Visual tuned drives			
1000MB	10ms	MC4110AV	$639
1700MB	10ms	MC2217AV	$989
2000MB	8.5ms	MC4221AV	$1469
3000MB	11ms	MC1936AV	$1699
4294MB	8ms	MC3243AV	$2359
9100MB	12ms	MC1991AV	$3499

Seagate

IDE			
260MB	16ms	ST3290A	$155
420MB	14ms	ST3491A	$199
545MB	12ms	ST5660A	$259
722MB	12ms	ST3780A	$325
1083MB	12ms	ST31220A	$485
SCSI (WIDE SCSI also available)			
1052MB	9ms	ST31200N	$569
1700MB	9ms	ST11900N	$1019
2145MB	8ms	ST12550N	$1199
2148MB	9ms	ST12400N	$1029
4290MB	9ms	ST15230N	$1979
4290MB	8ms	ST15150N	$2239
9080MB	11ms	ST410800N	$3339

HARD DRIVES

Quantum

IDE			
270MB	14ms	MV270A	$169
365MB	11ms	LT340A	$188
541MB	11ms	LT540A	$235
731MB	11ms	LT730A	$295
SCSI			
270MB	14ms	MV270S	$185
342MB	12ms	LPS340S	$215
540MB	14ms	MV540S	$242
541MB	11ms	LT540S	$249
731MB	11ms	LT730S	$325
1080MB	10ms	IMP1080	$549
1440MB	9.5ms	IMP1440S	$699
2160MB	9.5ms	IMP2160S	$959
4280MB	8.6ms	GP4280S	$2399

IBM

IDE			
364MB	12ms	70G8488	$195
527MB	12ms	70G8486	$259
728MB	12ms	70G8511	$329
1052MB	8.6ms	70G8512	$579
SCSI (WIDE SCSI also available)			
728MB	12ms	94G2422	$359
1052MB	8.6ms	70G8492	$609
2040MB	9.2ms	70G8493	$1149
4250MB	11ms	90F0780	$2179

SYQUEST SALE!

SCSI		Drive	PC Kit	Mac Kit
44/88MB	SQ5110C	$249	$379	$399
105MB	SQ3105S	$229	$349	$339
200MB	SQ5200C	$389	$549	$519
270MB	SQ3270S	$369	$519	$489
IDE		Drive	PC Kit	Portable
105MB	SQ3105A	$179	$269	$339
270MB	SQ3270A	$339	$439	$529

Cartridges Qty 2-4 / 5-9 / 10+ or with drive

44MB 66/61/57 88MB 70/66/64 105MB 56/54/53

200MB 83/77/75 270MB 65/62/59

MISCELLANEOUS

Drive Media! WIDE SCSI, Macintosh & Power Mac Drives, Hard Disk Cards, PCMCIA 2 1/2" Drives, Floppy Drives, IBM PS/1, PS/2, and Tandy Drives.

CD ROM DRIVES

SCSI				
Toshiba	XM3501	4X	120ms	$359
Plextor	PX43CH	4X	150ms	$449
NEC	CDR510	3X	195ms	$279
Toshiba	XM3401	2X	200ms	$255
Sanyo	SH93R	2X	280ms	$149
IDE (ATAPI)				
Mitsumi	CRMCFX400	4X	230ms	$249

MULTIMEDIA KITS

SCSI Drive, sound card (in retail pkg)

PREM=Media Vision Premium 3D. PRO=Media Vision Pro 3D

SB= Sound Blaster 16 SCSI. SA= Sound Blaster SCSI ASP.

	PREM	PRO	SB	SA
SH93R	$289	$409	$289	$349
XM3401	$425	$549	$425	$479
CDR510	$449	$569	$449	$499
XM3501	$569	$689	$569	$629
PX43CH	$599	$729	$599	$669

CONTROLLER CARDS

ADAPTEC	Alone	w/Drive
A1522BASIC 16Bit SCSI	$129	$109
A1542CBASIC 16Bit SCSI	$225	$215
A2742 EISA SCSI	$379	$369
A2842 VESA SCSI	$259	$249
A2940Kit PCI SCSI	$299	$289
Future Domain 1680 16Bit SCSI	$134	$119
QLOGIC PCI SCSI & WIDE	$325	$315
TEKRAM CACHING CARDS		
DC600CF 16Bit IDE	$89	$79
DC680C 32Bit Local Bus IDE	$109	$99
DC690C 32Bit PCI IDE	$149	$139
SCSI Controllers include COREL SCSI		
DC800B 16Bit SCSI	$199	$189
DC880B 32Bit Local Bus SCSI	$299	$289
TEKRAM NON-CACHING		
DC300B 16Bit SCSI w/ Corel	$159	$149
DC380B VESA SCSI w/ Corel	$179	$160
DC290N PCI Enhanced IDE	$45	$39
DC200S 16Bit IDE w/ High Speed IO	$55	$45
GSI 16Bit IDE accelerators (enhanced IDE)		
Boost Performance 30 to 80%! VESA coming soon.		
1533-21 2IDE, 4 Floppy	$65	$55
1533-32 2IDE, 4 Floppy, IO	$125	$115
4C 16Bit supports 8 IDE	$139	$129

Many other types of controllers in stock.

SCSI TAPE DRIVES

Kit includes 16bit card, DOS or Windows software & 1 tape.

			Bare	Kit
250MB	Conner	C2150	$349	$509
525MB	Conner	C2525	$479	$639
750-15Gig	Exabyte	2501	$499	$649
2Gig	Conner	4320	$749	$849
2Gig	HP	35470	$829	$929
NEW DRIVE! Back-up speed 54MB/min				
2-4Gig	Conner	3200	$589	$699
4-8Gig	Conner	4324	$859	$959
4-8Gig	HP	35480	$929	$1039
4-16Gig	Sony	SDT5000	$899	$1019
4-16Gig	Conner	4326	$959	$1089
4-16Gig	HP	C1533A	$1099	$1219
5-10Gig	Exabyte	8505	$2039	$2209

Backup Software

Novell NLM 50 user / unlimited	$199 / $339
NovaBack OS/2 / Mac	$89 / $109
Retrospect for Mac	$129
Desktape Mounts 4mm Tape on Mac Desktop	$275

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Smart Storage Solutions manufactures quality storage upgrades, and offers them at aggresive prices. All products include toll free support!

OPTICAL DRIVES

High quality drive made by IBM, high speed optical drive solutions include 1 disk.

	128MB	230MB	1.3Gig
Internal upgrade	$639	$719	$1899
Internal Kit	$769	$839	$1989
External for Mac	$689	$849	$1969
Portable for PC	$869	$1029	$2149

Other configurations available.

CD ROM DRIVE TOWERS

Multiple CD ROM drives in a single external enclosure. Great for networks, BBS, or business.

	2 Drive	4 Drive	7 Drive
Sanyo 93R	$369	$799	$1299
Toshiba 3401	$639	$1349	$2279
NEC 3X	$699	$1449	$2449
Toshiba 3501	$899	$1849	$3099
Plexstor 4X	$1069	$2199	$3779

Other configurations available.

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Houston, Texas 77058

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Never a Hidden Surcharge	YES		
$4.95 Shipping on Most Peripherals	YES		
Compaq Authorized for Direct Marketing	YES		
90 Days Same As Cash	YES		
Hewlett Packard and IBM Authorized	YES		
Low-Cost Business Leases	YES		
Volume Purchase Agreements	YES		
Customer Satisfaction Is Top Priority	YES		

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TravelMate 4000M

- ▲ Brilliant color display
- ▲ 16-bit sound card
- ▲ Integrated Pointing device
- ▲ 2 Type II or 1 Type III PCMCIA slot

Processor	Screen	Hard Drive	Price
486SX/25	8.2" Enhanced Color	120MB	$1879
486SX2/50	9.5" Dual Scan	200MB	$2759
486SX2/50	8.4" Active	340MB	$3099
486DX2/50	9.5" Dual Scan	340MB	$3049
486DX2/50	8.4" Active	455MB	$3649
486DX4/75	9.5" Dual Scan	455MB	$4439
486DX4/75	8.4" Active	340MB	$4889
486DX4/100	9.5" Active	525MB	$5549



as low as $1879

TM 4000M

CD-ROM Docking System

Transform your TravelMate 4000M into the Ultimate Mobile Multimedia System with the Portable CD-ROM docking system.

- ▲ Double-speed CD-ROM drive
- ▲ 250ms access time
- ▲ Built-in speakers
- ▲ SCSI II connector

$819.99



TravelMate CD-ROM Docking System

TEXAS INSTRUMENTS

TravelMate 4000E Color

Processor	Screen	Hard Drive	Price
486SX/25	8.2" Enhanced Color	120MB	$1699
486DX2/40	8.2" Enhanced Color	200MB	$2069
486DX2/50	9.4" Dual Scan	200MB	$2319
486DX2/50	8.4" Active	200MB	$2819
486DX4/75	8.4" Active	340MB	$3549
486DX4/75	8.4" Active	455MB	$3599
486DX4/75	9.5" Active	455MB	$3799



as low as $1699

TM 4000E

Hewlett Packard

The Perfect Notebook Companion

LaserJet 4L

$100 REBATE

- ▲ 4PPM
- ▲ Crisp, 300dpi print-quality
- ▲ 1-Year Warranty

LaserJet 4L $559.99*

*Price Includes $100 manufacturer's rebate through 1/31/95.



LaserJet 4L

LaserJet 4P

- ▲ Sharp, 600dpi print quality
- ▲ 2MB RAM w/Memory Enhancement Technology
- ▲ 1-Year Warranty

LaserJet 4P $959.99

DeskJet/DeskWriter 540

- ▲ Sharp, 600 x 300dpi "laser-like" print quality with REt
- ▲ 15% faster color printing with 512kb RAM
- ▲ 3-Year Warranty NEW!

DeskJet 540 $289.99
DeskWriter 540 $289.99

DeskJet/DeskWriter 320

- ▲ High-quality 3 PPM printing
- ▲ 600x300dpi with REt
- ▲ 1-Year Warranty NEW!

DeskJet 320 $299.99
DeskWriter 320 $299.99



DeskJet 320 Shown with sheet feeder and color kit option.

NEW!

DeskJet 1200C

- ▲ Sharp, 600x300dpi "laser-like" print-quality with ColorSmart
- ▲ 2MB memory expandable to 26MB
- ▲ 180-sheet paper tray
- ▲ 1-Year Warranty

DeskJet 1200C $1349.99
DeskJet 1200C/PS $1969.99

DeskJet/DeskWriter 560C

- ▲ Color 600 x 300 dpi "laser-like" print quality
- ▲ Resolution Enhancement Technology for smooth, crisp text and graphics
- ▲ 3-Year Warranty

DeskJet 560C $479.99
DeskWriter 560C $479.99

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*Price includes $150 manufacturer's rebate through 2/28/95.

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- ▲ 486SX/33 or DX2/50 processor
- ▲ 4MB RAM expandable to 20MB
- ▲ 9.5" Dual scan color display
- ▲ 2 Type II or 1 Type III PCMCIA slot

Model	Hard Drive	Price
4/33s Model 253W	250MB	$2099
4/33s Model 343W	340MB	$2259
4/50d Model 253W	250MB	$2349
4/50d Model 343W	340MB	$2499

Lease for as low as $60/mo.

Ascentia 900N

- ▲ 486DX2/50 or 486DX4/75 processor
- ▲ 4MB/8MB RAM exp. to 32MB
- ▲ 2 Type II or 1 Type III PCMCIA slot

Model	Screen	Hard Drive	Price
4/50 Model 343W	10.3" Dual Scan	340MB	$2719
4/50 Model 343W	9.5" Active	340MB	$4149
4/75 Model 343W	10.3" Dual Scan	340MB	$3219
4/75 Model 513W	10.4" Active	510MB	$5029

Lease for as low as $78/mo.

Ascentia 900N 10.4" Active Matrix screen now available!

Bravo LC Desktops

Extra Performance!

- ▲ 4/8MB RAM exp. to 64MB
- ▲ VESA local bus graphics
- ▲ MS-DOS 6.2, Windows 3.1
- ▲ Energy Star Compliant

Model	RAM	Hard Drive	Price*
4/33s Model 273W	8MB	270MB	$1289
4/50s Model 273W	8MB	270MB	$1319
4/66d Model 273W	8MB	270MB	$1579
4/66d Model 543W	8MB	540MB	$1669
4/100t Model 543	8MB	540MB	$1809

**AST Color Monitors start at $369.99*

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- ▲ 16-Bit Creative Labs Soundblaster
- ▲ 14.4 Send/Receive Fax modem w/telephone answering
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- ▲ 3-Year Warranty

Model	Hard Drive	Price*
486DX2/50 Desktop	540MB	$1349
486DX2/66 All-In-One	420MB	$1499
486DX2/66 Desktop	420MB	$1589
Pentium 60MHz Desktop	540MB	$1999

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ProLinea Desktops

- ▲ 4MB RAM expandable to 100MB
- ▲ 3.5" floppy drive
- ▲ Local bus graphics
- ▲ Pentium upgradable
- ▲ Energy Star compliant
- ▲ MS DOS 6.0, Windows 3.1

Processor	RAM	Hard Drive	Price
486SX/33	4MB	270MB	$1059
486SX2/50	4MB	270MB	$1169
486DX2/50	4MB	420MB	$1379
486DX2/66	4MB	420MB	$1499
486DX2/66	4MB	525MB	$1639
486DX4/100	8MB	420MB	$1999

**COMPAQ color monitors start at $239.99*

LTE Elite

- ▲ 486 processor
- ▲ 4/8MB RAM exp. to 20/24MB
- ▲ Built-in AC adapter
- ▲ Removable hard drive
- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Integrated trackball
- ▲ MS-DOS 6.2, Windows 3.1, MS Video for Windows Run Time

Processor	Display	Hard Drive	Price
486DX2/40	9.5" Dual Scan	170MB	$3119
486DX2/40	8.4" Active	170MB	$3779
486DX2/40	8.4" Active	340MB	$4159
486DX2/50	9.5" Mono	250MB	$3299
486DX2/50	9.5" Active	340MB	$4999
486DX4/75	9.5" Active	340MB	$5669
486DX4/75	9.5" Active	510MB	$6139

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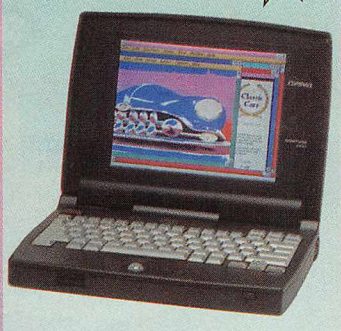
Contura 400

- ▲ 486DX2/40 processor
- ▲ 4MB RAM expandable to 20MB
- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Large built-in trackball
- ▲ MS-DOS, Windows 3.1, Tabworks, Lotus Organizer

Display	Hard Drive	Price
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8.4" Active	250MB	$3119

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- ▲ 2 Type II or 1 Type III PCMCIA slots
- ▲ Removable hard drive and floppy drive
- ▲ Removable screen
- ▲ Integrated speaker, microphone
- ▲ MS-DOS, Windows 3.1, Windows Sound System, Video for Windows Run Time

Processor	Hard Drive	Screen	Price
486DX4/75	250MB	Dual Scan	$3739
486DX4/75	540MB	Active	$5199
486DX4/100	810MB	Active	$6049
486DX4/75	540MB	Enhanced Active	$5579
486DX4/100	810MB	Enhanced Active	$6429
486DX4/75	340MB	True Color Active	$5099

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- ▲ Fax modem
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- ▲ CD titles: Compton's Encyclopedia, PFS Window Works

Processor	Hard Drive	Price*
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486DX2/66 Desktop	340MB	$1479
486DX2/66 Minitower	420MB	$1539
P60 Minitower	420MB	$1999

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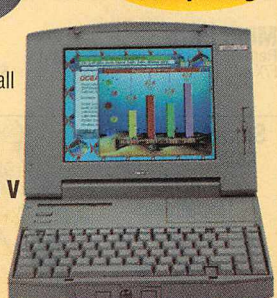
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- ▲ 2 Type II PCMCIA slots or 1 Type III
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- ▲ Removable hard drive
- ▲ Removable floppy – add second battery

Screen	Hard Drive	Price
9.5" Dual Scan	250MB	$2499
9.5" Dual Scan	340MB	$2669
9.5" Active	250MB	$3249
9.5" Active	340MB	$3399
9.5" Active	540MB	$3779

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Versa S

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- ▲ Upgradable hard drive
- ▲ SurePoint integrated pointing device
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- ▲ Only 4.5 lbs.

Processor	Screen	Hard Drive	Price
486SX/33	9.5" Mono	210MB	$1699
486SX/33	9.5" Dual Scan	210MB	$1889
486SX/33	9.5" Active	210MB	$2839
486DX2/50	9.5" Active	260MB	$3299
486DX2/50	9.5" Active	350MB	$3499

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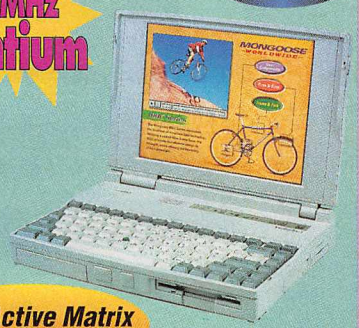
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- 10.4" active matrix color display
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- Accupoint integrated pointing device
- MS-DOS 6.21, Windows for Workgroups 3.11, Windows Sound System 2.0, Indeo Video, and Run Time Video for Windows

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75MHz Pentium



10.4" Active Matrix Color Display

T4900

Satellite Notebooks

HOT PRODUCT

- 4MB RAM expandable to 20MB
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- 82-key keyboard
- MS-DOS, Windows 3.1
- Ballpoint mouse with Quickport (T1900s)
- Accupoint pointing device (T2400)
- Enhanced power management

as low as $1319

Model	Processor	Screen	Hard Drive	Price
T1910	486SX/33	9.5" Mono	200MB	$1319
T1910	486SX/33	9.5" Dual Scan	200MB	$1779
T1960	486DX2/50	9.5" Dual Scan	200MB	$2159
T1960	486DX2/50	9.5" Dual Scan	320MB	$2329
T1960	486DX2/50	8.4" Active	200MB	$2749
T1960	486DX2/50	8.4" Active	320MB	$2919
T2400	486DX2/50	9.5" Dual Scan	250MB	$2749
T2400	486DX2/50	9.5" Dual Scan	320MB	$2879
T2400	486DX2/50	8.4" Active	250MB	$3349
T2400	486DX2/50	8.4" Active	320MB	$3469

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- PCMCIA Type II slot
- External 3.5" disk drive
- Integrated AccuPoint pointing device

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Processor	Screen	Hard Drive	Price
486SX/33	7.8" Active	250MB	$2899
486DX2/50	8.4" Active	250MB	$3469

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T4700, T4800 and T4850

- Brilliant color display with local bus video
- 2 PCMCIA slots (Type II, Type III)
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- MS-DOS, UltraFont, Indeo video compression software, Windows for Workgroups 3.11 and Run Time Video for Windows

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Model	Processor	Screen	Hard Drive	Price
T4700	486DX2/50	9.5" Active	200MB	$3979
T4700	486DX2/50	9.5" Active	320MB	$4239
T4800	486DX4/75	9.5" Active	500MB	$4829
T4850	486DX4/75	10.4" Active	520MB	$5199
T4850	486DX4/75	10.4" Active	810MB	$5569

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T4700

TOSHIBA



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$449.99

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XJ1144	14.4/14.4 XJACK	$209.99
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XJ2144	14.4/14.4 XJACK GOLD	$249.99
CC4144	14.4/14.4 PCMCIA GOLD	$249.99
XJ2288	28.8/14.4 XJACK	$449.99
CC3288	28.8/14.4 PCMCIA	$449.99

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ThinkPad® 360

ThinkPad 360® notebooks

HOT PRODUCT

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- Local Bus Graphics with 1MB video RAM
- 2 Type II or 1 Type III PCMCIA slot
- TrackPoint II integrated pointing device
- IBM DOS 6.3, Windows 3.1, Lotus cc:Mail, Organizer, ScreenCam, Official Airline Guide FlightDisk, CoSessions Host, Prodigy, America Online, and FaxWorks 3.0
- Port Replicator and Docking Station available

Screen	Hard Drive	Price
9.5" Monochrome	170MB	$1839
9.5" Monochrome	340MB	$2229
9.5" Dual Scan	170MB	$2279
9.5" Dual Scan	340MB	$2659
8.4" Active Color	170MB	$2719
8.4" Active Color	340MB	$3099

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8.4" Active	540MB	$3969

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486DX2/50	4MB	9.5" Mono	200MB	$1699
486DX2/50	4MB	9.5" Dual Scan	200MB	$2179
486DX2/50	8MB	9.5" Dual Scan	340MB	$2549
486DX2/50	4MB	9.5" Active	340MB	$3309

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- User upgradable processor, memory, hard drive, display and more
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- Integrated trackball
- Two Type II or one Type III PCMCIA slot
- MS-DOS, Windows for Workgroups, Microsoft Sound System
- 3-Year Warranty

Processor	RAM	Screen	Hard Drive	Price
486SX/33	4MB	10.4" Mono	200MB	$2449
486DX2/50	4MB	10.3" Dual Scan	200MB	$2869
486DX2/50	4MB	10.3" Dual Scan	340MB	$3149
486DX2/50	4MB	9.5" Active	340MB	$4339
486DX2/50	8MB	9.5" Active	450MB	$4759
486DX4/75	8MB	9.5" Active	520MB	$5339

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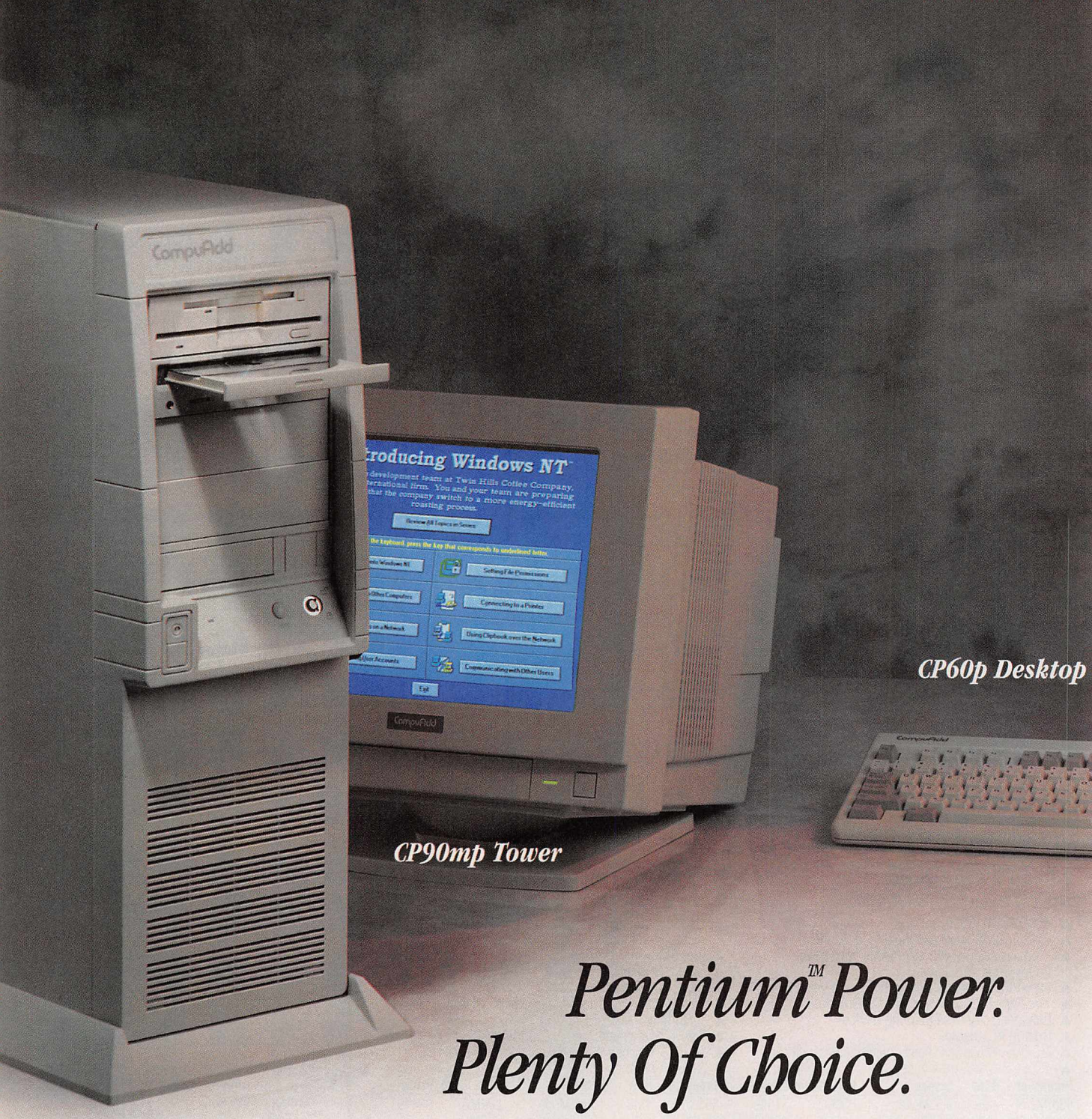
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- MS-DOS & Windows for Workgroups
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- 730MB 12ms IDE hard drive
- 1MB graphics accelerator
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- Microsoft Works Multimedia CD

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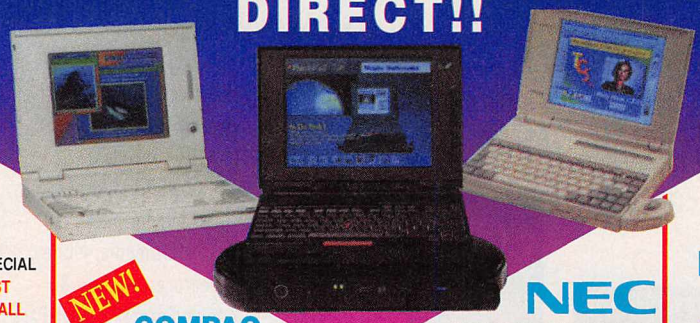
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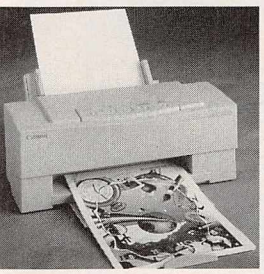
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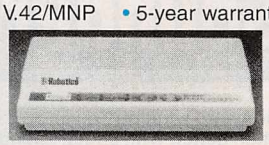
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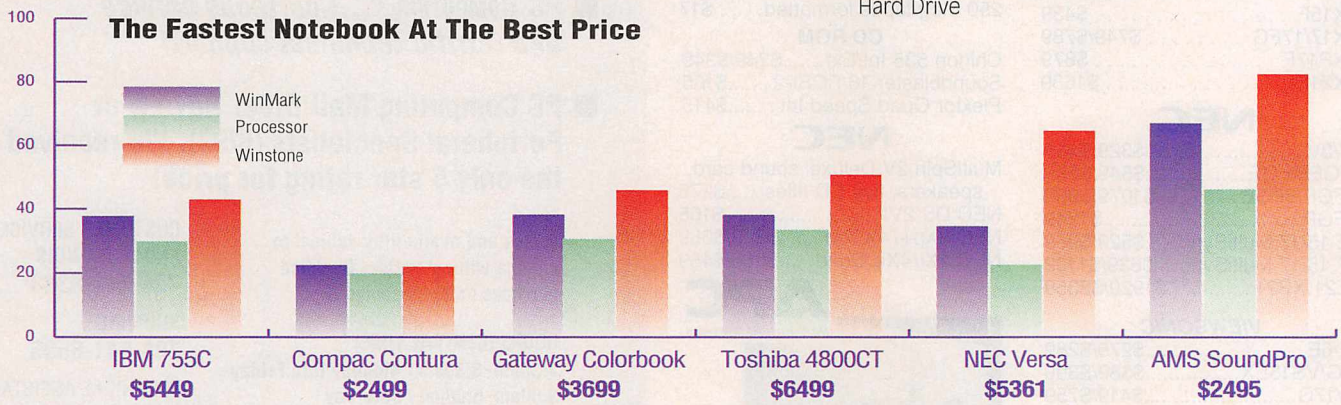
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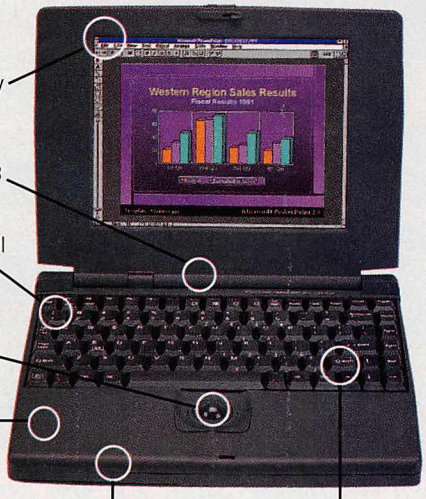
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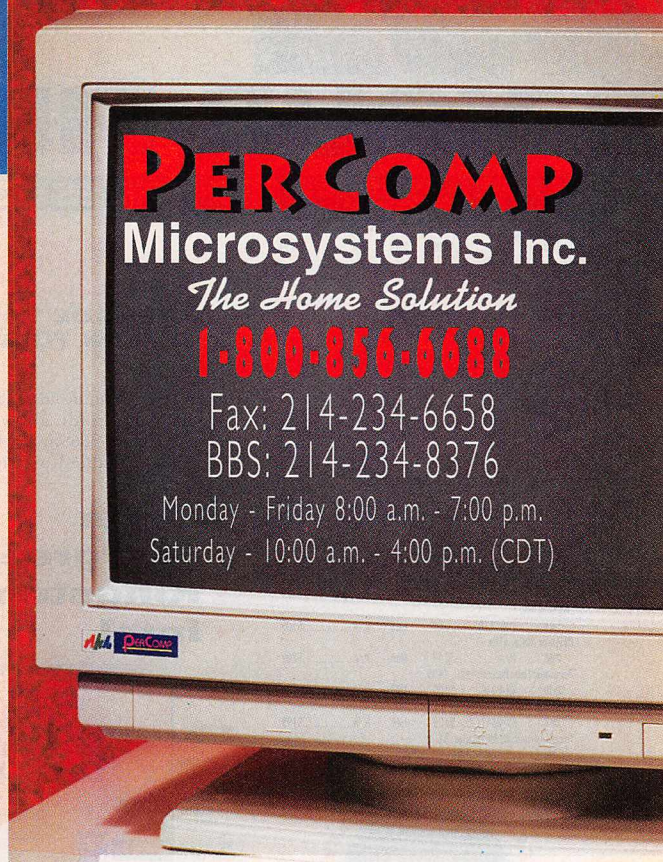
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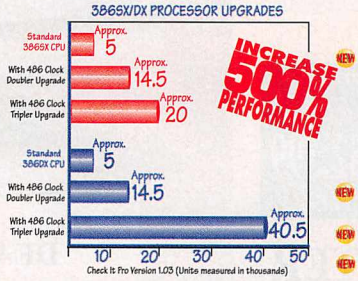
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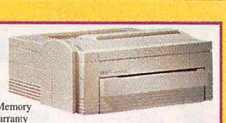


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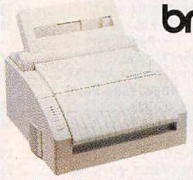
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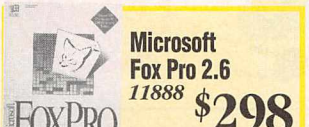
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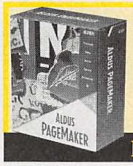
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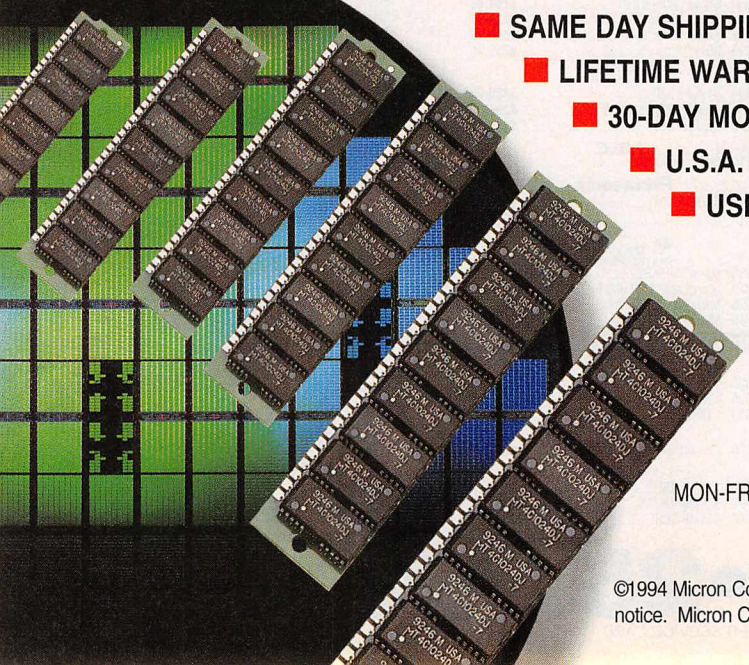
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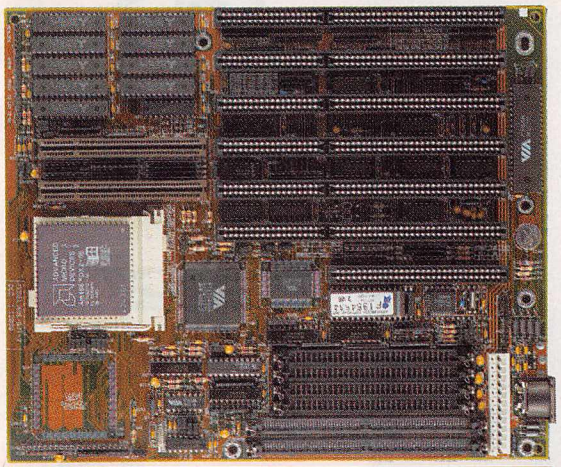
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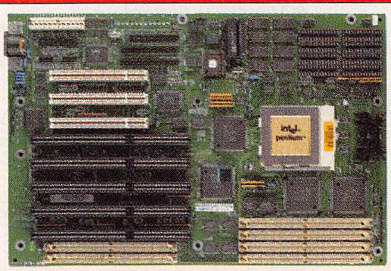
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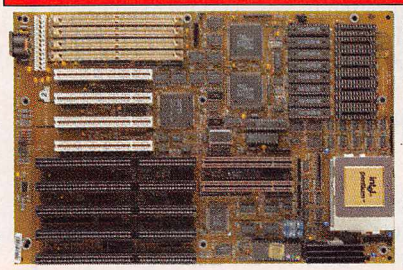


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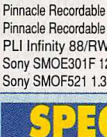
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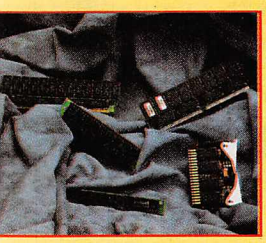
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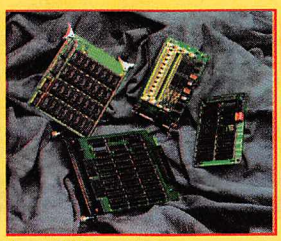
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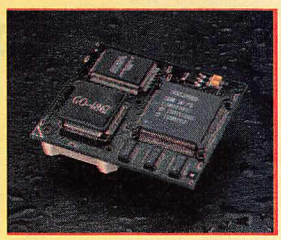
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MEMORY FOR IBM & APPLE	50NS	60NS	70NS	80NS	100NS
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1Mgx4	–	59.00	55.00	54.00	–
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	8Meg	500987-003 (72 pin)	330.00
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	32Meg	500987-005	1399.00
Premium 486/25, 25E, 33, 33E			
Premium 386/33TE, 486/25TE, 33TE			
Prem. Serv., Prem II 386SX/20, 25			
Prem. II 386/25, 386/33, 486/33, 486SX/20	8Meg	500780-001	398.00
Premium 386/33T, Prem. 3868X/16			
Prem. II 386SX/20, 25	4Meg	500780-004 (64 pin)	189.00
Premium 386/25, 33, 386/33T, 386SX/16,	1Meg	500780-003	59.00
Prem. II 386SX20,25	1Meg	500780-001	59.00
Premia 4/33S, 4/33, 4/50D, 4/66D	8Meg	501159-002	379.00
Premia	16Meg	501159-003	789.00
Premia	32Meg	501159-004	1469.00
Premia	64Meg	501159-005	3111.00
AST Cupid Bd	0–32Meg	500818-001	179.00

ZENITH MEMORY MODULES

MODEL	AMT. UPGRADED	AST PART #	PRICE
Z386/33, 25, 20, 33E	1Meg	ZA3800ME	59.00
Z386/33, 25, 20, 33E, 486/25E	4Meg	ZA3800MK	180.00
Z386SX	2Meg	Z-605-1 modules	119.00

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6450379 (2Meg)	80-111, 311-121, 321, 081, 161	84.00
6451060 (4Meg)	80-A21, A-61, 80-A31, 80-111, 80-311	189.00
6450604/92G7196 (2Meg)	70-061, E61, 121, 50Z, 55SX, P-70, 55LS, 65LS, X-Station 120 & 130, 35SX, 35LS, 40SX	99.00
6450608 (2Meg)	70-A21, A-61, B-21, B-61, 35SX, 35LS, 40SX,'Val Pt. 325T	90.00
78X8955 (128K)	25	35.00
34F2933 (4Meg)	35SX, 40SX, 55SX, 65SX, 55LS, 65LS	175.00
87F9977/92G7199 (4Meg)	55SX, 55LS, 65SX, 40SX, 35SX, 35LS	175.00
1057035 (512K)	P/S1-286	49.00
92F9935 (2Meg)	P/S1 & P/S1/386SX-2121	109.00
92F9694 (4Meg)	P/S1 & P/S1/386SX, Model-2121	189.00
92G7200 (4Meg)	PSI Expert, Consultant, Willow	175.00
92G7201, 73G3131 (4Meg)	Value Point Performance, PC Server 4/66	175.00
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6450128/92G7200 (4Meg)	57SX, 90, 95, P-75, 57SLC, 56, 56SLC, P/S1, 386SX, Mod-2123, 2133, 2155, Val Pt 77, 486C52, 486SX, SVR85 Value Point 77 486DX2, 486SX, SVR 85	175.00
6450129/92G7428 (8Meg)	35SX, 40SX	339.00
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92F8804 (2Meg)	N45SL	109.00

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MODEL	AMT. UPGRADED	CMPQ PART #	PRICE
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	8Meg Module	116561-001	399.00
	32Meg Module	116568-001	1399.00
DeskPro 386/33L, 486/33L	(Exp Bd)	116569-001	279.00
DeskPro 386/25, 386/20	1Meg Module	113131-001	79.00
	4Meg Module	113132-001	199.00
DeskPro 386S-16MHz	1Meg Exp Bd	113633-001	149.00
	4Meg Exp Bd	113634-001	279.00
	1Meg Module	113646-001	79.00
	4Meg Module	112534-001	199.00
DeskPro 386/20E	1Meg Exp Bd	113644-001	149.00
DeskPro 386/25E	4Meg Exp Bd	113645-001	279.00
	1Meg Module	113131-001	79.00
	4Meg Module	113132-001	199.00
DeskPro 286N, 386N, 386SX20, all "M" series, sytem LT series, all "I" series	1Meg Module	118688-001	59.00
	2Meg Module	118689-001	89.00
	4Meg Module	118690-001	169.00
	8Meg Module	128877-001	339.00
M Series Exp Bd	0-64Meg	129160-001	189.00
DeskPro 386/16	1Meg Kit	108071-001	99.00
	4Meg Kit	108072-001	299.00
	1-2Meg Exp Bd	108069-001	239.00
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DeskPro 286	512K Kit	113012-001	49.00
DeskPro 5/60, 5/66M, 5/66M (ALL OF THESE MACHINES USE THESE MODULES)	8Meg Kit	149911-001	389.00
Prosignia 5/60	16Meg Kit	149949-001	699.00
Proliant 1000 5/60	32Meg Kit	149912-001	1356.00
Proliant 2000 4/30, 5/66	64Meg Kit	149913-001	2516.00
Proliant 4000 4/50, 5/66	128Meg Kit	149914-001	5799.00
Prolinea 386 3/25S, 3/25ZS	2Meg	141738-001	90.00
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LTE/386S/20	4Meg Module	121125-002	209.00
LTE LITE/20, 25, 25C	4Meg Module	129769-002	209.00
LTE LITE/20, 25, 25C	8Meg Module	129769-003	409.00
LTE LITE/20, 25, 25C	16Meg Module	129769-004	809.00
LTE LITE 425C/33C/25E/25L	4Meg Module	142337-002	189.00
LTE LITE 425C/33C/25E/25L	8Meg Module	142337-003	349.00
LTE LITE 425C/33C/25E/25L	16Meg Module	142337-004	718.00
SLT/286	4Meg Module	110237-001	219.00
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SLT/386	4Meg Module	118305-001	219.00
Concerto, LTE Elite	4Meg	144790-001	189.00
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Contura 320, 325	2Meg	139497-001	99.00
	4Meg	139498-001	189.00
	8Meg	139499-001	339.00
Contura 400	4Meg/8Meg/16Meg		209/389/719
Contura 4/25, 4/25C, 4/25CX	4Meg	146520-001	189.00
	8Meg	146521-001	339.00
	16Meg	146531-001	689.00
Aero 4/25, 4/33L	4Meg	190532-001	184.00
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T2000/T2000SX	2Meg	PC18-PA8317U	89.00
T2000SX/T1000LE	4Meg	PC-PA8314U	189.00
T2000SX/T1000LE	8Meg	PC14-PA8315U	359.00
T2000SXE/2200SX/T1800, 1850, C	2Meg	PC-PA2000U	89.00
T2000SXE/2200SX/T1800, 1850, C	4Meg	PC-PA2001U	189.00
T2000SXE/2200SX/T1800, 1850, C	8Meg	PC-PA2002U	359.00
T4400SX, SXC T6400, T6600	4Meg	PC-PA2004U	189.00
T4400SX, SXC T6400, T6600	8Meg	PC-PA2005U	359.00
T4400SX, SXC T6400, T6600	16Meg	PC-PA2010U	699.00
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	4Meg	PC-PA2012U	209.00
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	8Meg	PC-PA2013U	389.00
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	16Meg	PC-PA2014U	769.00
T3300SL	6Meg	PC-PA2008U	269.00
T3300SL	16Meg	PC-PA2009U	699.00
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T3100SX	2Meg	PC15-PA8308U	109.00
T3100SX	4Meg	PC15-PA8310U	189.00
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T3200SX	2Meg	PC12-PA8307U	119.00
T3200SX	4Meg	PC12-PA8909	199.00
T3200SXC	2Meg	PC19-PA8318U	119.00
T3200SXC	4Meg	PC19-PA8319U	199.00
T5100	2Meg	PC7-PA8301U	95.00
T5200/T8500	2Meg	PC10-PA8304U	114.00
T5200/T8500	8Meg	PC10-PA8313U	419.00

NOTEBOOK, LAPTOP MEMORY

MODEL	AMT. UPGRADED	MANU. PART #	PRICE
ACER 730, 735C, 780	2Meg/4Meg/8Meg		109/209/399
ACER 750	4Meg/8Meg/16Meg		199/459/869
ALR Venture	4Meg	12407980	249.00
AST Ascentia 900N, 800N	4Meg/8Meg/16Meg		199/379/699
AST Bravo & Explorer	4Meg/16Meg	501255-001, -002	189/669
AST Notebook Prem Exec 386SX/20/25/25L	4Meg	500814-003	189.00
AST Power Exec 3/25C, 425EL, 425SL	4Meg/16Meg	501166-001, -003	199/699
AST Power Exec 4/33SL	4Meg/16Meg	501318-001,002	194/769
AT&T Safari NSX/20	4Meg	PEC 37651	259.00
Bondwell B310, Plus	1Meg	23050-09100	109.00
Bondwell B310V, SX	1Meg		109.00
Bondwell B310V, SX	4Meg		229.00
Canon Innova 486	2Meg/4Meg/8Meg		109/209/449
Canon Innova 486-10	4Meg/16Meg		189/829
Canon Notejet 486	4Meg/ 8 Meg		199/389
Dell Lattitude	4Meg/16Meg		199/749
Epson Action Note 700	4Meg/16Meg		199/689
Epson NB3	4Meg	A808511	299.00
Everex Tempo LX, LX20, Carrier	2Meg	PCA 00053-0001	109.00
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Gateway 2000 Nomad 425 DXL/SXL	4Meg/16Meg		199/1199
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Goldstar GS920 386SX/16	4Meg	S386-4M	249.00
Grid 1720, 1790, 1755	1Meg		59.00
HP Omnibook 300, 480, 425	2Meg/4Meg		129/269
HP Omnibook 530	4Meg/8Meg/12Meg		239/449/819
Magnavox Metalis	1Meg/4Meg	286, 386SX	109/199
NCR Safari 3180	4Meg/ 8 Meg		239/449
NEC Prospeed 386	2Meg	PC31-21	119.00
NEC Prospeed 386	8Meg	PC31-22	399.00
NEC Prospeed 286, 386SX-16, 386SX-20	2Meg	PC21-21, PC43-21	79.00
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NEC Ultralite Versa, E, V	4 Meg/8Meg/16Meg/20Meg	OP4104	183/359/739/919
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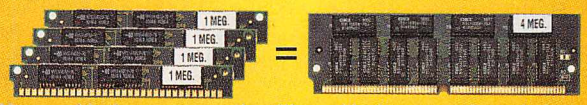
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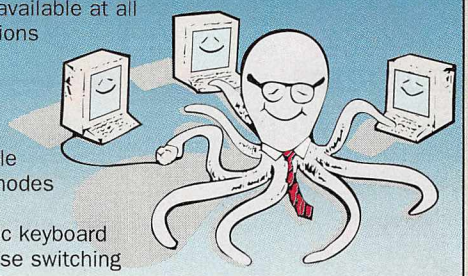
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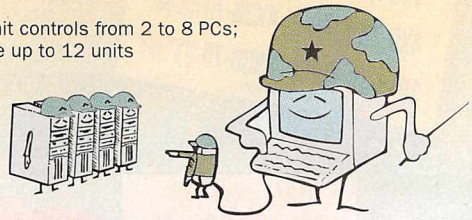
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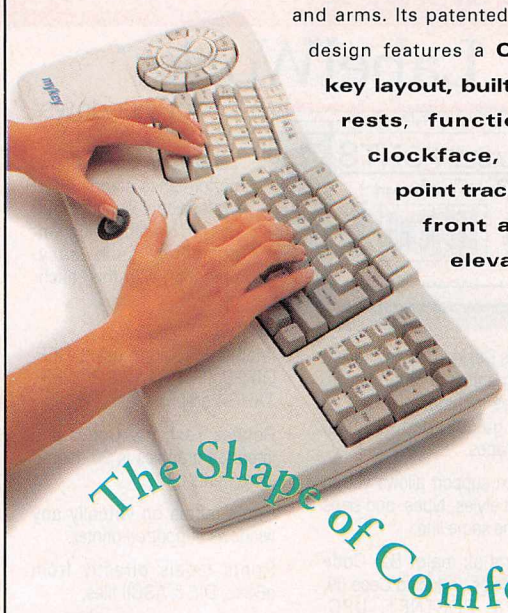
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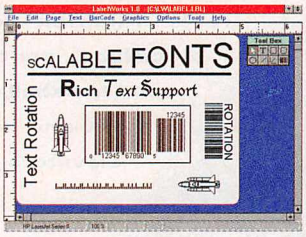
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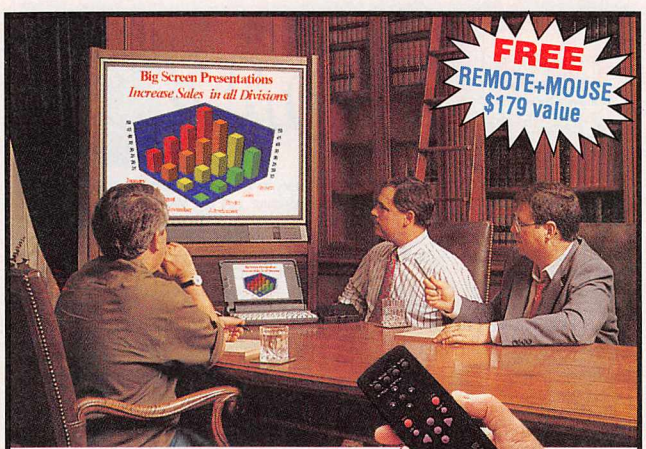
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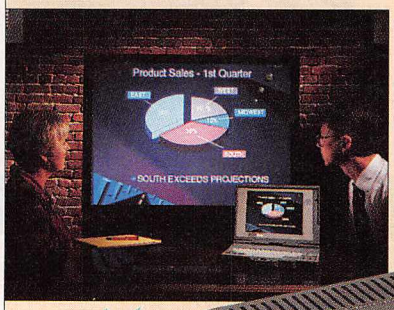
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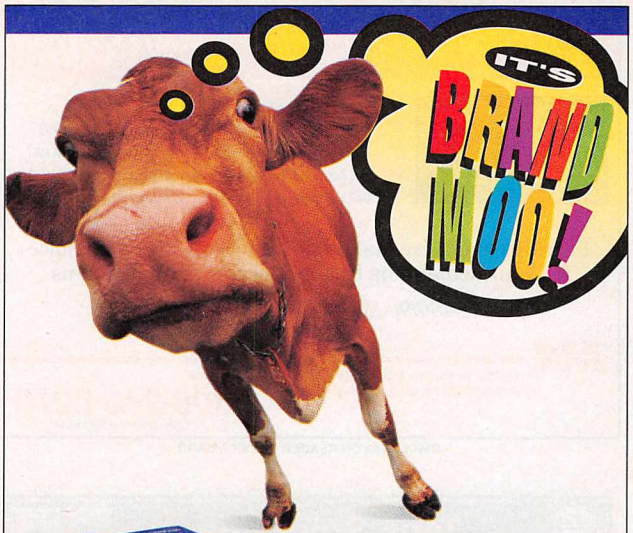
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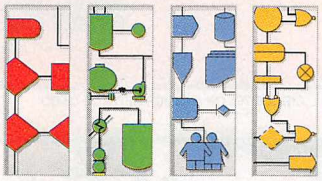
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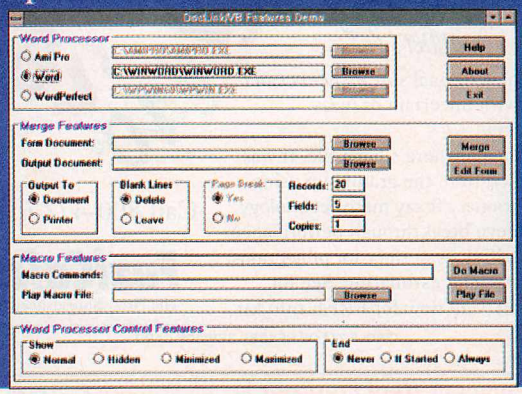
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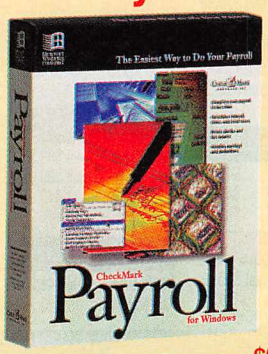
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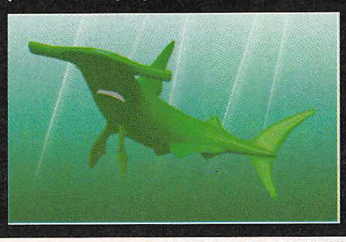
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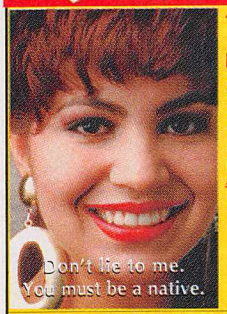


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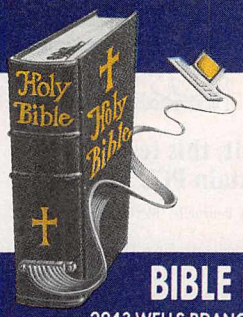
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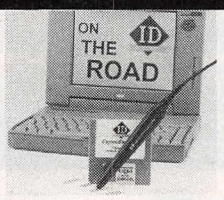
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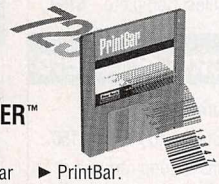
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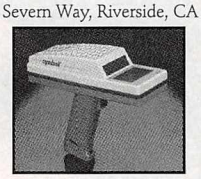


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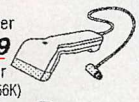
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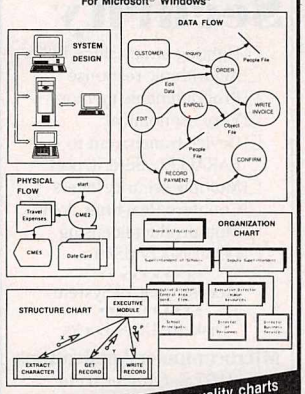
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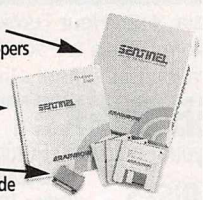
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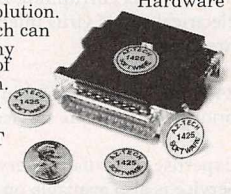
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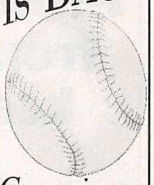
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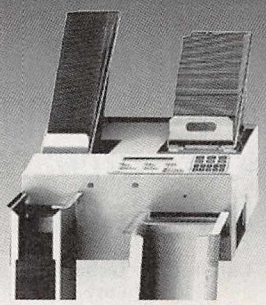


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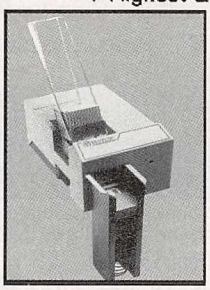
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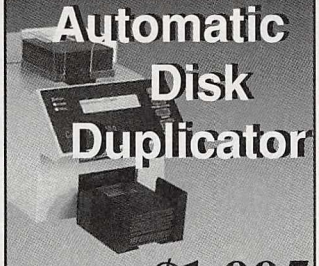
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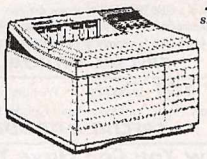
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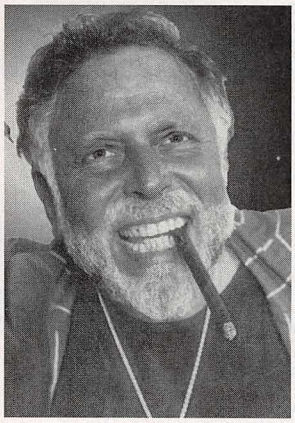
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03. ☐ Networked together

7. Please check the equipment currently installed at your location: (Check all that apply.)
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06. ☐ Windows

8. Do you plan to buy any PC products?
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PC MAGAZINE

Coming Up

Color Notebooks: Power to Go

You can get more power in the same package (or a lighter one), as we found out in our latest notebook roundup. We tested 68 portable PCs equipped with 486-class or Pentium processors; since color is quickly displacing monochrome in the market, all the units we tested had either active- or passive-matrix color displays. These systems ranged in weight from just under 4 pounds to just under 9 pounds. Some even included CD-ROMs. And with built-in sound becoming more commonplace, your presentations can fully exploit multimedia capabilities, even on the road.

Photo Illustration Software

We've seen the distinction between image-editing and paint programs become blurred in the past couple of years. In the process, a new category—photo illustration—has been forged. With this change in mind, we evaluate six Microsoft Windows–based photo illustration packages; we accepted only those products that support pressure-sensitive digitizing tablets. We test each package's ability to handle an amalgam of painting and image-editing tasks. For example, we examine brush tools, paint types, masking options, and color-handling features. While some products can manage a variety of tasks, several packages remain strong in either image editing or painting, so we work to direct you to the right packages for your needs.

PCMCIA Connectivity

PCMCIA is a compelling technology, but it has had problems, including excessive system memory requirements, incompatible software, and hardware design flaws. This past year has been an important one, though. Both PCMCIA specifications and products have improved and show lots of promise for the future. We take a look at the technology and its practical implications, particularly in the area of PC connectivity. We'll review some representative PCMCIA modems and LAN adapters and give you updates on compatibility issues. We'll also do some checks of other PCMCIA products. Find out where PCMCIA leaves you now and where it is headed.

Making Notes More Noteworthy

The phone numbers are in your computer and the modem is attached, so why can't you dial out automatically from your Lotus Notes database? Notes has helped to make people-oriented databases more visually usable and sharable, even across platforms. Notes does not, however, provide an interface to let you connect to the telephone. But there are ways to do so, as Brian Proffit demonstrates in our next Extending Your Apps column.

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Backup-UPS/Smart UPS 600 ..... 259/349
Backup-UPS/Smart UPS 900 ..... 369/489
Backup-UPS/Smart UPS 1250 ..... 499/599
Professional SurgeArrest w/Telephone 29
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BC/Smart 400 (400 V/A) 159/279
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730MB	IDE	WD27ØØA	10ms	3.5" 1"H	299
1080MB	IDE	WD31ØØØA	10ms	3.5" 1"H	439
CONNER					
540MB	IDE/SCSI	CFA54ØA/S	10ms	3.5" 1"H	$259/279
1060MB	IDE/SCSI	CFP1Ø62A/S	9.5ms	3.5" 1"H	479/539
FUJITSU					
530MB	IDE/SCSI	FJ2684A/S	12ms	3.5" 1"H	$219/239
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After Hours

EDITOR'S RATINGS: ★ Poor ★★ Fair ★★★ Good ★★★★ Excellent

DOS Windows CD-ROM Resource-Intensive Adult Content Kids (Ages) Price

Music Software to Soothe the Savage PC

If you'd love to make music but can't bear suffering through hours of practice, there's good news and bad news: The bad news is that practice is still necessary, but the good news is that some of the suffering is now optional with the help of music education software. Most of the music education titles are designed as games, with friendly interfaces and bright, inviting graphics to make learning music more fun than it's ever been. Even if all you want is musical entertainment and a bit of information, the selection of PC software catering to your musical tastes is growing daily.

Midisoft Music Mentor

★★★ WIN $49.95

Midisoft Multimedia Songbook

Midisoft Corp.; 206-881-7176.

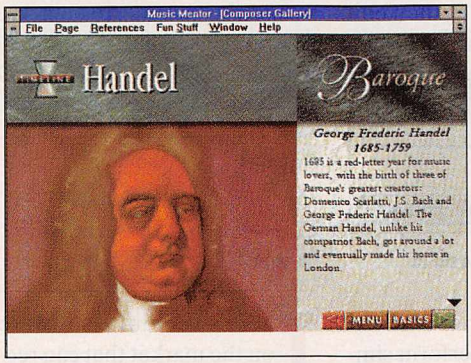
Circle 497 on reader service card

★★★ WIN $39.95

Long known for its advanced PC music software, Midisoft Corp. enters the music edutainment field with two strong products.
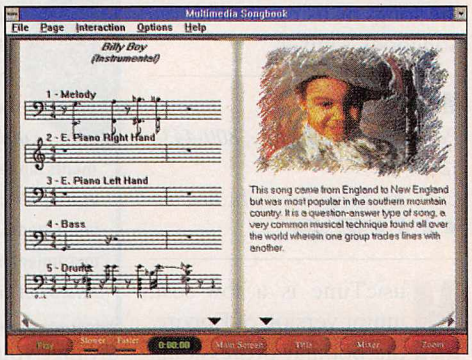
Midisoft Music Mentor covers a lot of ground in the music edutainment field, from fun tutorials that guide you through a variety of musical topics such as notation and harmony, to biographical sketches of figures in the music world.

The many lessons and guided practice sessions encourage you to develop basic skills in music theory and musicianship. There's also a mixer for rearranging the MIDI selections and an instrument gallery, both of which are also in Midisoft Multimedia Songbook. An automated historical time line allows you to trace the history of music and understand it in the context of the events and society around it. The section on contemporary performers, profiling such figures as Chuck Berry and Stevie Wonder, lets you listen to selections in their styles, although not to samples of the artists' own work. The brief dictionary of musical terms can pronounce each word and use it in a sentence.



Midisoft Music Mentor touches on most of the elements of a good, basic music education.

Even more along the lines of an electronic music-appreciation class is Midisoft Multimedia Songbook. This CD-ROM features a collection of over 190 songs that you can play on your PC using a MIDI sound board. The seven categories include Holiday Favorites, Kids' Songs, Classics, Jazz Hits, Pop Tunes, International, and Inspirational. Older tunes are better represented than modern ones. The piano arrangements are warm and musical, while the more fully orchestrated pieces suffer from the limitations of MIDI. You can also read quick bits of background information about many of these songs.



Midisoft Multimedia Songbook provides close to 200 songs you can play on your PC.

You can find more information about the instruments used to record these songs in the Instrument Gallery; here there are entertaining and informative summaries of the best-known instruments and their histories and characteristics, and a few random attempts at humor that aren't terribly funny and dilute the authority of the information.

Since Midisoft makes the notation and sequencing programs that are included with many popular sound cards, it's not surprising that Multimedia Songbook includes limited notation and mixing components. Perhaps the highlight of this package is the Midisoft

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Photography by Thom O'Connor

Noodler, which allows you to perform inspired improvisations of the songs in the collection (if you have a MIDI keyboard). You can also watch the music scroll by in real time on the notation screen and can rearrange or reorchestrate any of the songs by using Multimedia Songbook's mixer.

MusicTime

Passport Designs Inc.; 800-443-3210.

Circle 499 on reader service card

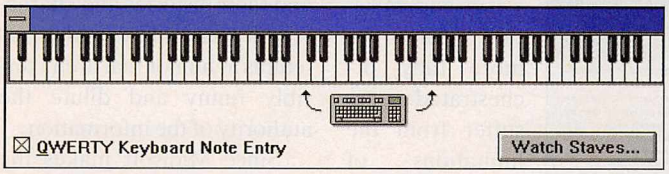
★★★★ WIN $99

MusicTime is a low-cost, junior version of Encore, the popular professional notation package from Passport Designs. Though not as powerful as its older sibling, it has a personality all its own and a few unique features that make it a bit more useful to the casual, nonprofessional user.

This package is intended as a recreational music tool, and though some study is required to get to know it, the documentation makes using MusicTime as easy as can be for MIDI under Windows. You can use your QWERTY keyboard to input music and hear it play, although it's easier to work with a MIDI instrument. You can also use your mouse to click notes onto the standard musical staff and play them back, then select, copy, and paste to rearrange your opus.

MusicTime also serves as a rudimentary sequencer and MIDI editor, which makes it useful as a good, basic MIDI music utility. You can load a MIDI file from any source, let MusicTime notate it, then edit it yourself to reassign instrumental parts and perform simple balancing and mixing using the usual Windows cut-and-paste methods. Of course, there are other products available to fill these functions at a much more sophisticated level (many also sold by Passport), but if you need a Swiss Army knife for MIDI files, MusicTime will fill the bill.

Don't be misled by the goofy beatniks on the splash screen; though MusicTime is meant for fun, it's entirely suitable for producing professional printed scores as long as they're not too ambitious. With a maximum of four voices on up to eight staves, it can handle most standard piano-vocal or quartet music. You wouldn't want to tackle Beethoven's Ninth Symphony with MusicTime, but for $99 it's hard to beat.



You can use your regular computer keyboard to compose music in MusicTime.

PROBLEM SOLVER

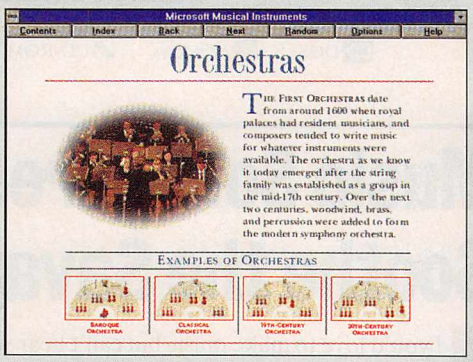
If you're serious about making music on your PC, you ought to invest in a sound card with wavetable synthesis. The hundreds of instrument voices provided by such cards make digital music sound more real.

Microsoft Musical Instruments

CD-ROM PICK HIT

Of the handful of electronic music guides available on CD-ROM, few compare with Microsoft Musical Instruments. It takes you on tour of a wide musical world with over 200 instruments from alto sax to zither, indexed and cataloged for your listening pleasure. The program includes Families of Instruments, which classifies instruments by the method they use to make music; the Musical Ensembles section, which tells you how instruments make music together; and Instruments of the World, which explains the origin and heritage of the instruments. You simply click an icon to hear each instrument playing.—*Bill Dyszel*

Microsoft Corp.; 800-426-9400, 206-882-8080.



Circle 503 on reader service card

★★★ WIN $59.95

Soloist

Ibis Software; 415-546-1917.

Circle 498 on reader service card

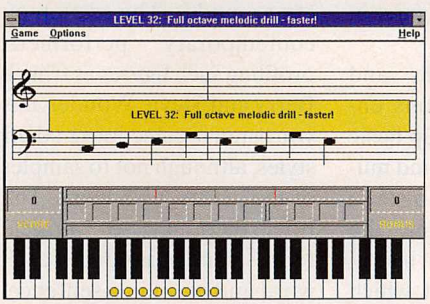
★★★ WIN $59.95

There's very little software on the market that can recognize pitch from a microphone, and what exists is very limited in ability. Solois,t from Ibis Software, is one of the few music education games that use a microphone for input rather than a keyboard or other MIDI device.

The purpose of the game is to read the notes presented on the screen and sing or play their pitches accurately into the microphone. Soloist doesn't really recognize absolute pitch; it can distinguish C from D, but it can't always distinguish middle C from high C because of the acoustical phenomenon known as the overtone series. Overtones allow your ear to tell the difference between a piano and a trumpet, even when they play the same note, but they make it very difficult for a PC to determine the fundamental pitch of a note accurately. Given the difficulty, Soloist is a primitive but useful tool for teaching beginning sight singing.

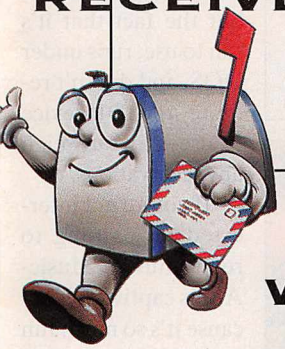
The best thing about Soloist is that it doesn't require you to use a MIDI instrument; in fact, only a normal acoustic instrument will work. There are some drawbacks to the program, however: It will not save your input in MIDI format, the games are limited to three keys (C, F, and G), and rhythm is not considered at all.

—Bill Dyszel



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Kids

Putting the Fun in Music Fundamentals

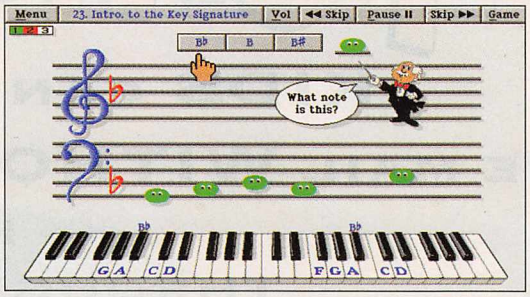
MusicAce

Harmonic Vision; 708-467-2395.
Circle 500 on reader service card

★★ C> 8-18 $59.95

MusicAce is an educational game designed to teach beginners the most rudimentary elements of pitch matching and key signatures. It's recommended for ages eight and up, but it's really most suitable for the preadolescent set.

The package as a whole is lively, colorful, and inviting, and the graphics and musical samples are unusually well done for a DOS game. At the core of the program lie a series of lessons designed to teach beginners fundamental music skills such as scales, key signatures, and keyboard basics. After each of the self-paced lesson, young musicians can test their newly acquired knowledge by playing arcade-like music games MusicAce also includes a jukebox for playing the included song files, and a Music Doodle Pad for creating and playing users' simple compositions with a variety of different instrument sounds.





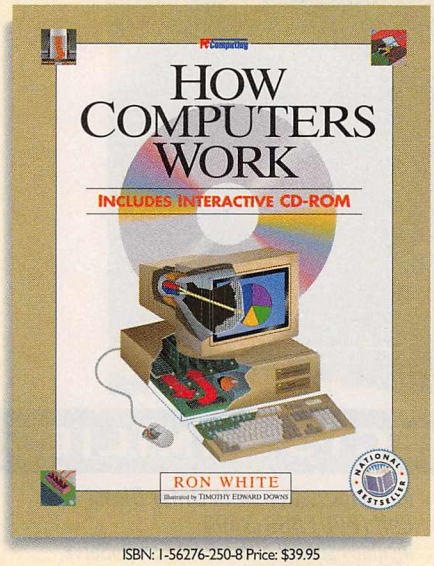
The Music Maestro will help kids have fun while they learn the basics of pitch in MusicAce.

Parents and educators should take note that MusicAce focuses entirely on pitch, not rhythm, and when rhythm gets involved, MusicAce does not use standard musical notation with note stems and tails; it relies on its own system of variously shaped note blobs to express rhythmic value. That may not fit everyone's teaching philosophy, but the fact that it's fun to use, runs under DOS, and doesn't require a MIDI device to use may outweigh any reservations.

If you're not interested in learning to read music, MusicAce is captivating because it's so much fun to watch. The program opens by showing you a grand staff accompanied by a catchy, boogie-woogie tune. As the tune plays, cartoon notes jump around the staff. It's a merry musical animation that makes learning fun.—*Bill Dyszel*

Click Click.

PC/Computing How Computers Work CD-ROM/Book extravaganza from Ziff-Davis Press.



ISBN: 1-56276-250-8 Price: $39.95

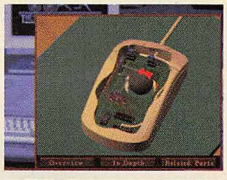
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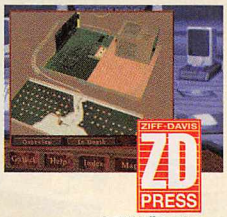
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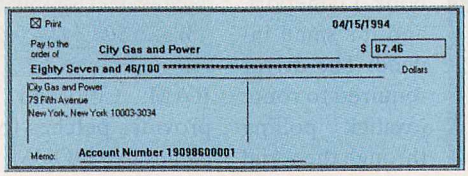
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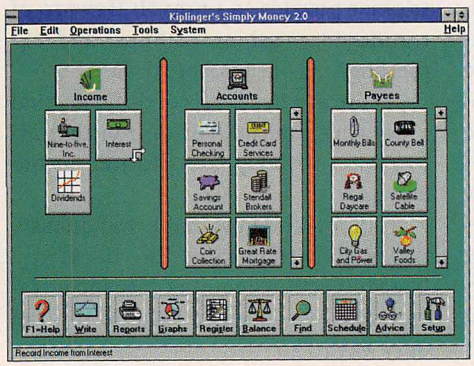
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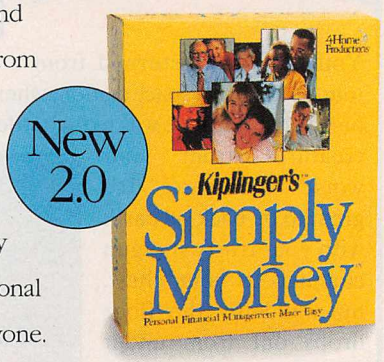
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CIRCLE 216 ON READER SERVICE CARD

Gadgets

Bringing Gaming to Your Laptop

Notebook Gameport

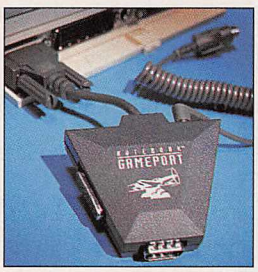
Colorado Spectrum; 800-238-5983.

Circle 501 on reader service card

★★★ $54.95

Walk down the aisle of any business flight and you may find as many IBM ThinkPads being used to play Microsoft Flight Simulator as are being used to calculate spreadsheets. Now that notebook PCs pack more computing punch than ever and come outfitted with color graphics and sound capabilities, they're ready to take on the world of computer gaming—with one exception: They lack a game or joystick port.

Enter Colorado Spectrum's sleek Notebook Gameport, which converts your laptop's serial port into a fully functional joystick port. Just plug this device into your serial port, plug in the joystick, and you're ready to fly. And for those who need to connect an external modem or mouse to the laptop in addition to the joystick, there's a pass-through serial port built into the Notebook Gameport into which you can plug those devices.



The Notebook Gameport is a must for gamers.

There is only one downside to using the Notebook Gameport, and it's small indeed: The driver required to route joystick polling through the serial port takes up about 1K of RAM. Colorado Spectrum provides patches for popular games like DOOM, Microsoft Flight Simulator, and X-Wing for direct support of the Notebook Gameport. With this device, even dedicated gamers may find that the desktop PC is rapidly becoming obsolete.

—Bernard H. Yee

QUICK CLIPS

Recommended
? It's Your Call
Not Recommended

Band-in-a-Box for Windows, Version 6.0

This venerable automated composition package now lets you create your own styles and harmonizes melodies in the manner of great jazz and swing masters. *$88; PG Music Inc.; 800-268-6272.*

? Caroline's Presents. . .Johnny Cocktails

What's a nice Claymation comic doing on a CD-ROM like this? Combine jokes into a comedy routine and you'll soon discover the answer: a short run. *$49.95; Great Bear Technology; 800-795-4325.*

The Pianist, Volumes 1 and 2

A virtuoso MIDI piano player, over 400 well-played classical piano favorites, and a music trivia game for the serious music buff. *$49 per volume; PG Music Inc.; 800-268-6272.*

? Popular Mechanics New Car Buyers Guide 1995

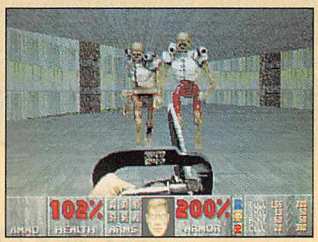
This multimedia CD-ROM database provides all the information you need to make an informed buying decision, but some of the data is probably already out of date. *$30; Books That Work; 800-242-4546.*

SPOTLIGHT ON ACTION

DOOM II

You have just returned from a tour of duty on a space station, where the only way to survive was to do battle with creatures from your worst nightmare. It's great to be back on earth with your trusty shotgun clutched to your chest, but suddenly the floor drops out from under your feet and you find yourself face to face with a fire-breathing demon from hell. Welcome to DOOM II: Hell On Earth.





The action and gore fly fast and furious in DOOM II.

Much like its predecessor, DOOM II is a fast-paced, intense action game that pits you against mutants, monsters, and demons. As in the original, you're in the driver's seat, and you're viewing the 3-D action through the eyes of a marine whose mission is to free the earth from scores of hell-spawned creatures. If you make it through the first level, you're in good shape. But don't be fooled. There are still 31 more levels to plow through, and it gets harder as you go along.

The biggest difference between the two games is that this one is a commercial release only; there will be no shareware episodes to try before you buy. And this new version is available on floppy or CD-ROM. DOOM II also offers up more creatures than the original, along with a new weapon, the double-barreled super shotgun, which comes in handy but takes twice as long to reload. And the new version has trickier puzzles to unravel: Beware of trapdoors, crushing ceilings, and exploding vats of radioactive waste.

There are five levels of difficulty and a network/multiplayer option that allows up to four players to join in the carnage.

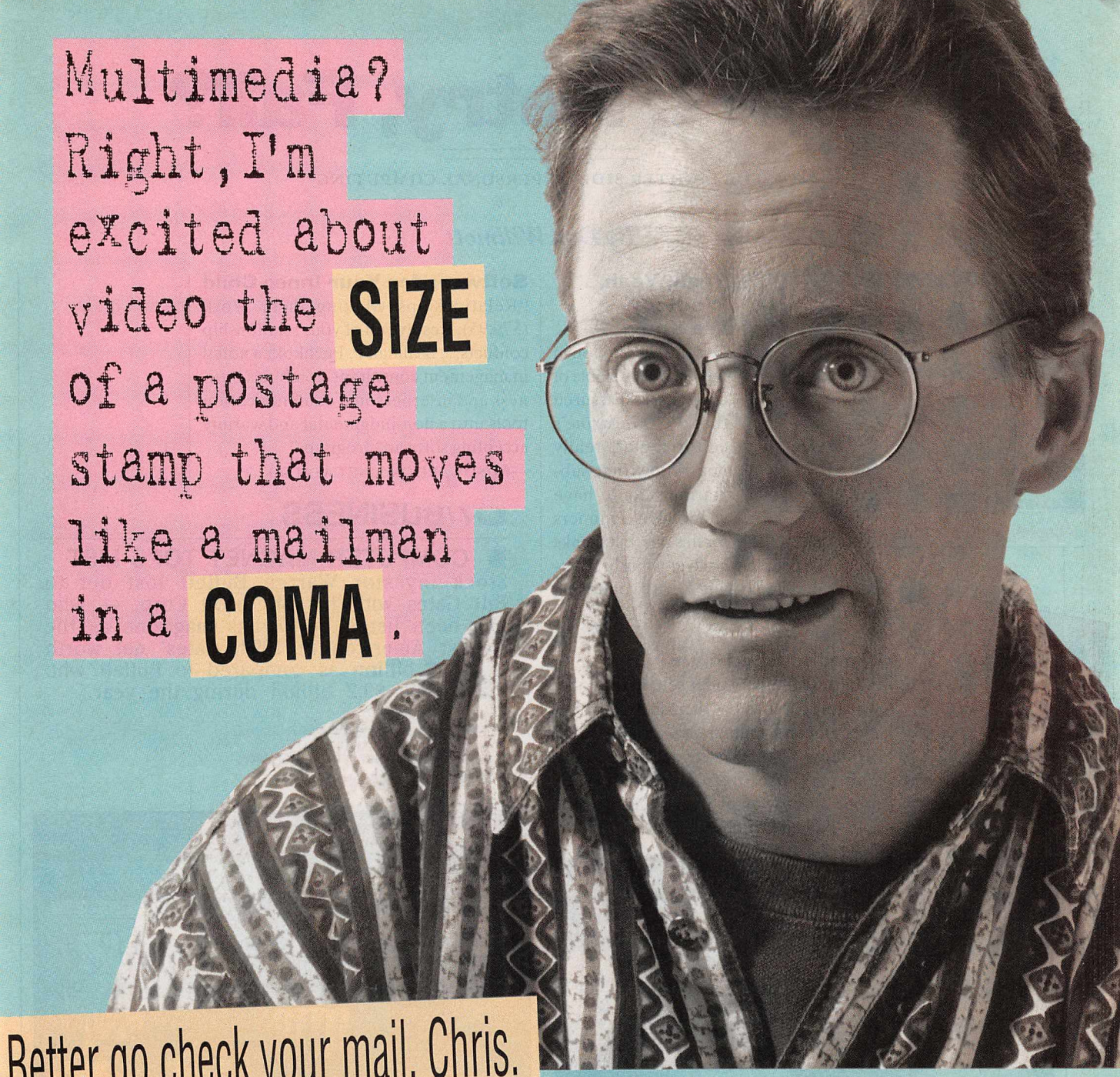
If blood and guts make you queasy, this is the wrong game for you. If you like your action lightning-fast and ultraviolent, however, then DOOM II is the only way to go.

—John Delaney

GT Interactive Software; 800-362-9400.

Circle 504 on reader service card

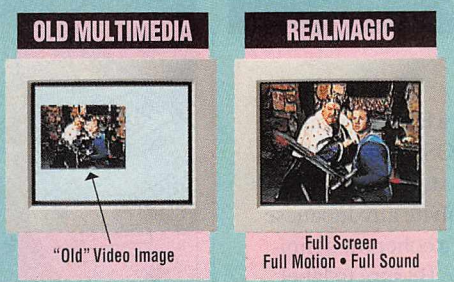
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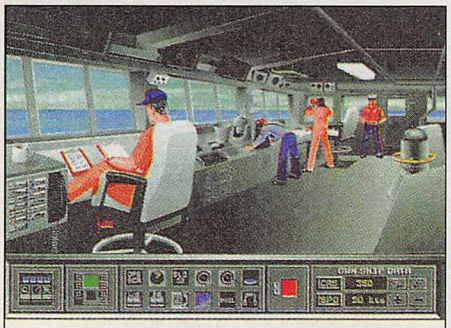
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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott



Captain your own submarine (page 422).

Yeah, Yeah, We Know, We Know

Despite the caption in our October 25 table of contents, rest assured that *PC Magazine*'s editorial staff really does know that submarines don't have windows. No winners for this one, but thanks to the 106 people who so graciously pointed it out. Jeez—we were wondering whether people really read the ToC.

Wooden Shoe-mur

A faithful Dutch reader sent in this joke, which apparently has them in hysterics all over Holland, though we're not sure why: "Rumors say that Chicago, Daytona, and Cairo are just forerunners for a much more ambitious project at Microsoft, code-named Lutjebroek!"

Software for Your Inner Child

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Truth in advertising. (Office Max catalog.)

BUSINESS

■ **COMPUTER MAGNET TOPS LIST**

Stock investor Warren Buffett lost out to Bill Gates with his Microsoft Corp. — who has been listed by Forbes magazine as the richest American in 1994. Gates' net worth is $9.35 billion as compared to Buffett who made only $9.2 billion during the year.

Bill Gates on your refrigerator door. (*Mobile Press Register.*)



Good idea: *InformationWeek* ran a blurb about the questionable future of paper books. Bad idea: It was illustrated with a 1930s photo of Nazi brownshirts enjoying a book burning.



Jay Munro

Overheard

"I get waku-waku when I turn on my PC."—JAPANESE OS/2 USER IN OS/2 WARP PROMOTIONAL VIDEO

(We cordially invite any Japanese speaker to send in a coherent definition of *waku-waku.* Be sure to label your entry "Attention: Waku-waku.")

If your entry is used, we'll send you $50 and a *PC Magazine* T-shirt. Send your entries to Abort, Retry, Fail?, *PC Magazine,* One Park Ave., New York, NY 10016-5802. Winners this issue: Robin Bakkerus, Thomas Fasulo, Angela Gunn, James Nash, and Sarah Warmanen.

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